PLC Editor Overview

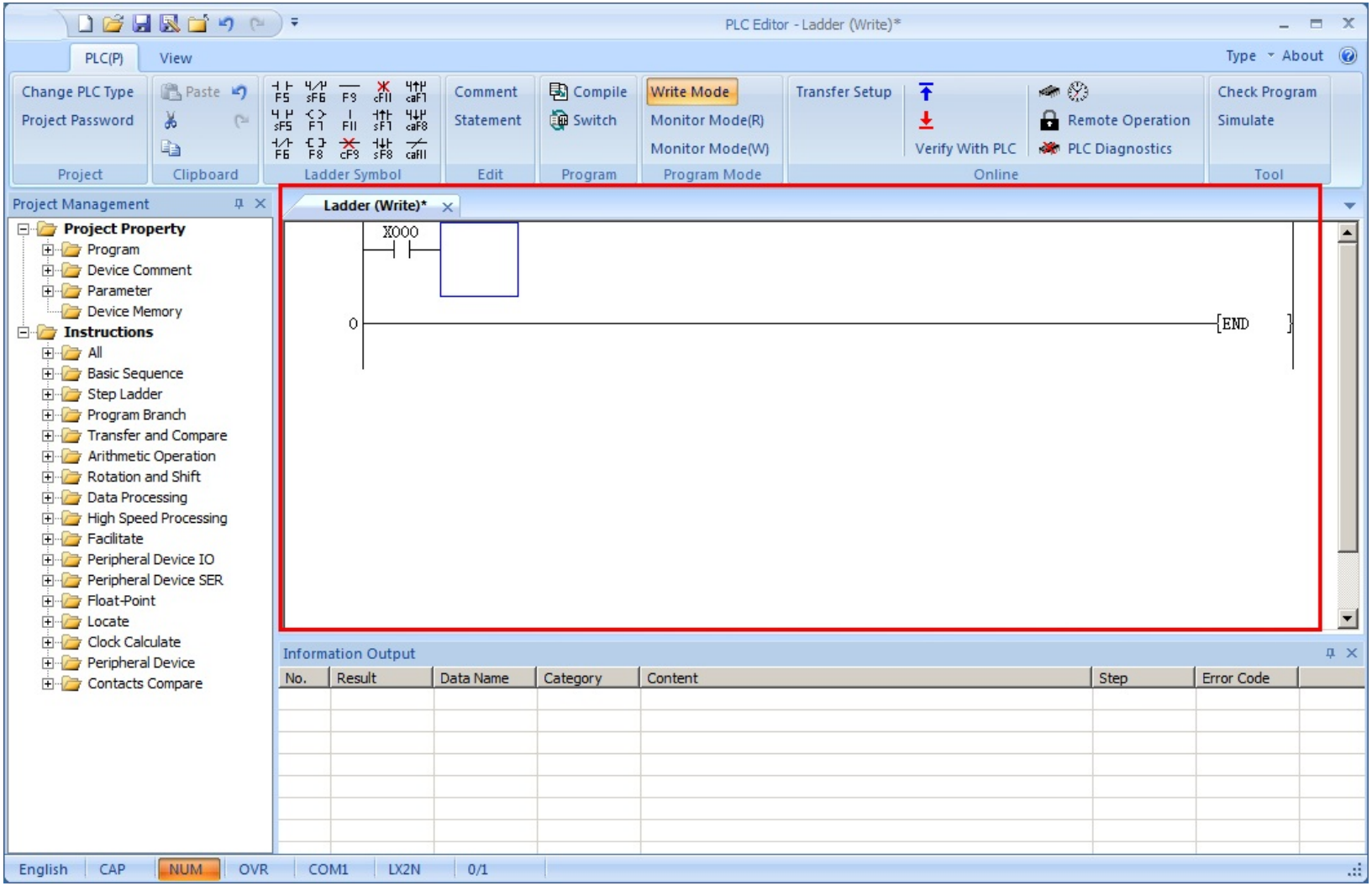
PLC(Programmable Logic Controller)is an electronic system with digital calculation operation, which is designed for applications in an industrial environment.

It reads external input state signals of keys, sensors, switches, and pulse waves. Based on these input signal states or values and the internal storage pre-prepared program, the logic, sequence, timing, counting and arithmetic operations are implemented by micro-processor, then producing corresponding output signals, such as: switching relay, and controlling machinery equipment operation. The settings of the program and monitor device can be easily edited and modified by using computer or program editors, to maintain the on-site program or to debug.

Ladder programming:

Based on the model of relay control system, PLC ladder diagram programming method uses the electrical theory and adopts the components used in the designation similar to the time electrical device, such as button X, intermediate relay M, time relay T, counter C, contact points, and etc..

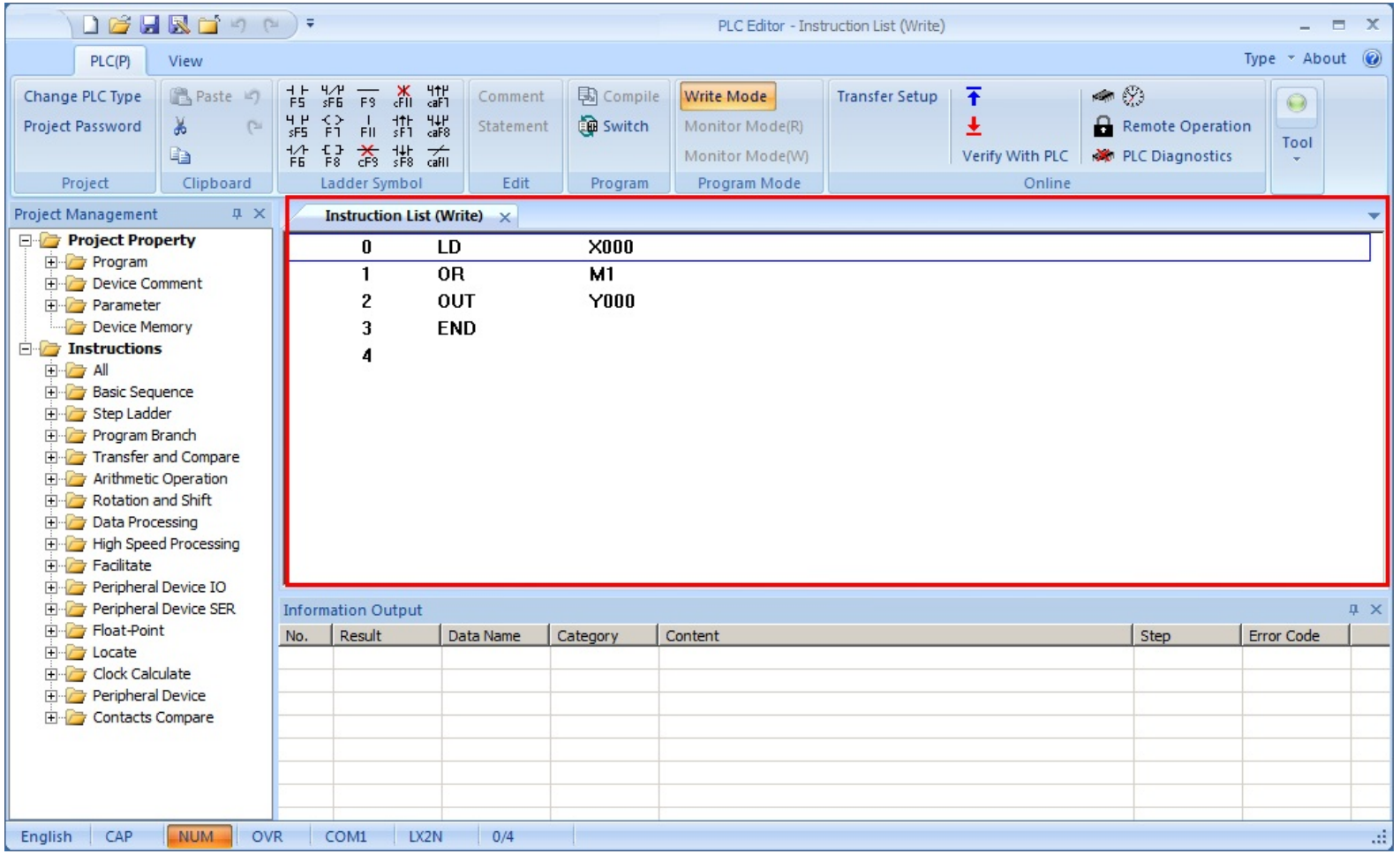
Illustration:



Instruction list programming:

The instruction list program editor is a text editor. All logic and calculations are inputted using instruction and operand. Based on the functional instructions completed and the associated soft components in operand, the value of soft component is read, and logic processing and the value of soft components are written.

Illustration:



Program conversion:

These two programming languages mentioned above are interchangeable based on user's preference or the practicability of the controlling environment. Users can choose the most appropriate programming language.

Illustration:

Outline

This section briefly describes the use of PLC programming software to write a simple PLC control program and programming operations, to help beginners become familiar with and master the programming software operation. The following is the PLC development steps

The first step:Start programming software, enter the program window.

Step Two:Point "New" pop-up "New Project" window, set the "PLC Series", "PLC Type" and "programming language."

Step Three:In the "Project Management" area, click the "Programs" to start writing the ladder program.

Step Four:Add instruction.

Step Five:Save the program.

Step Six:Compile.

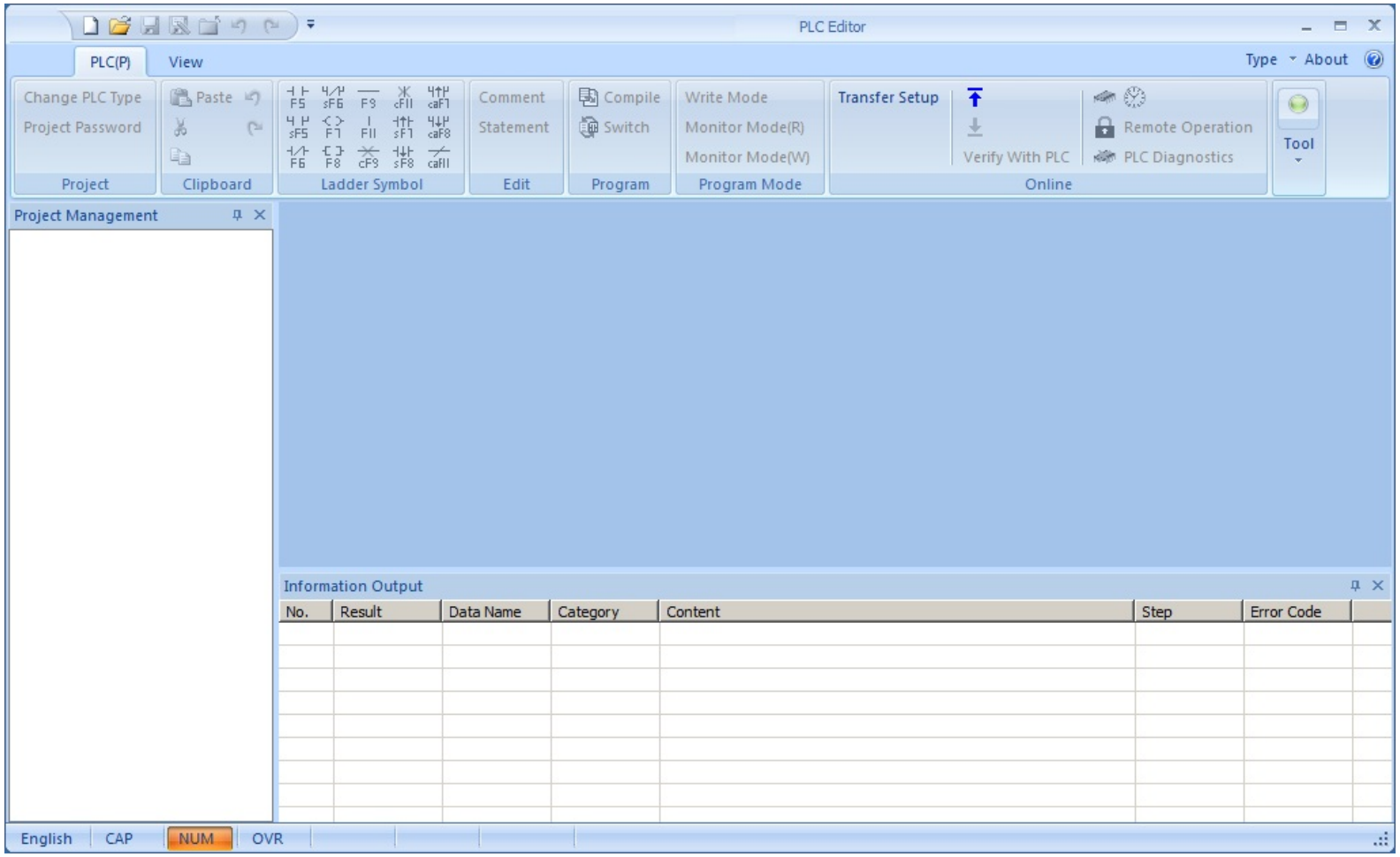
Step Seven:Communication with the PLC.

Step Eight:Write to the PLC

Step Nine:Start PLC (RUN state)

Start the software

PLC properly installed, click the Windows Start menu of programming - PLC Editor Programming Software,Start the PLC programming software, programming into the main screen, the main screen as shown below:



Create Project

Start programming environment, you first need to create a new project.Click "New"---"New project" and the following dialogue will be displayed, select or create a new project:

PLC Series

PLC Type

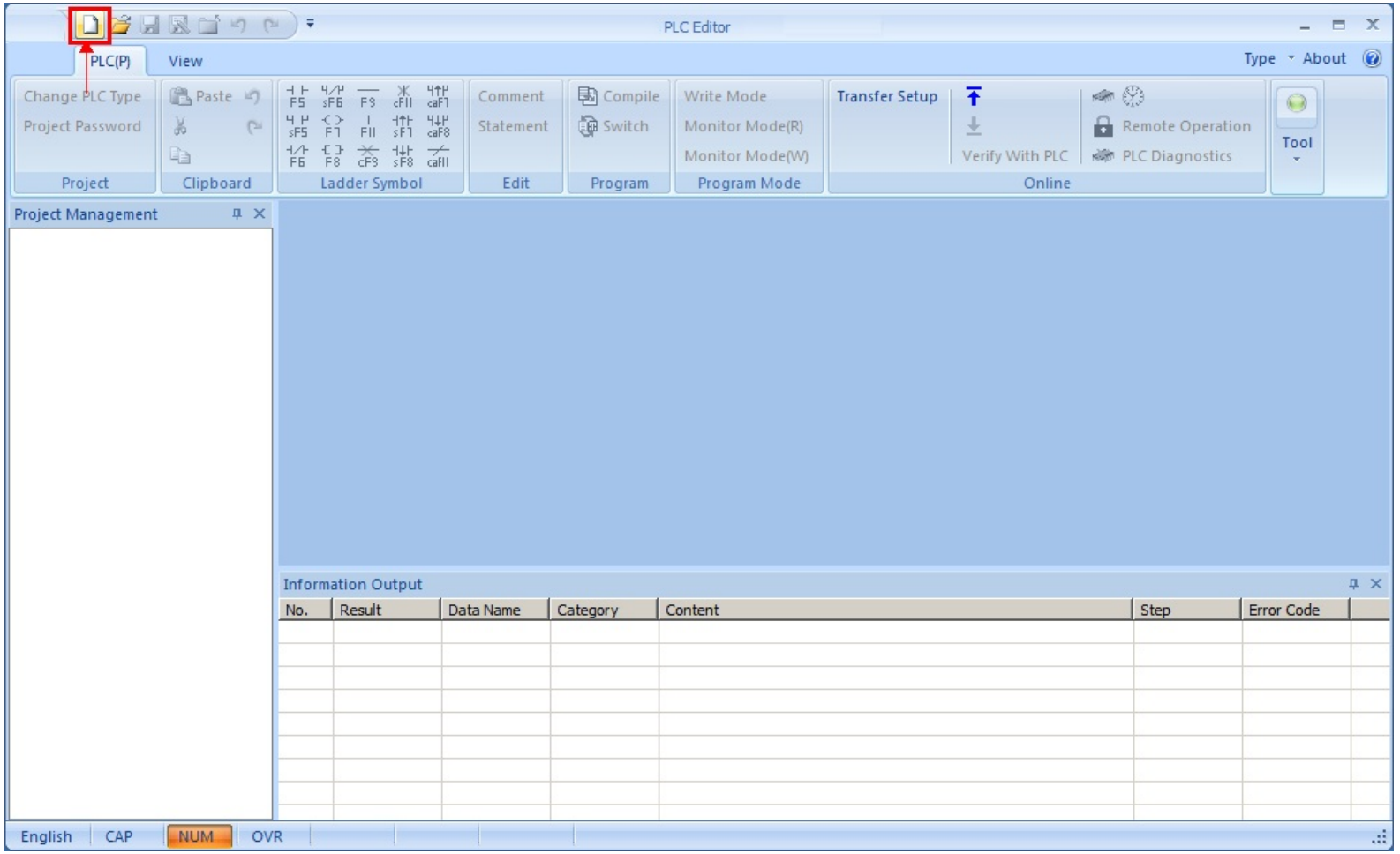
Program Language

Please create a new project as shown figure instructions

1.Move the mouse to the top left corner of the program,Click [File] menu

2.After clicking [File] menu , a new module will be displayed

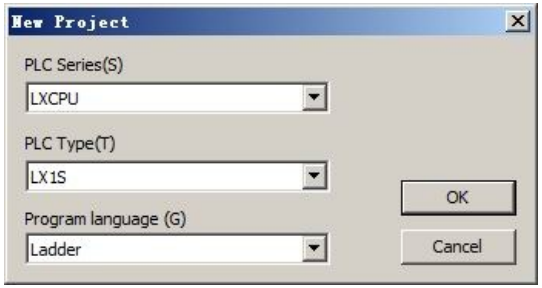
3.Click [New] , and click to enter



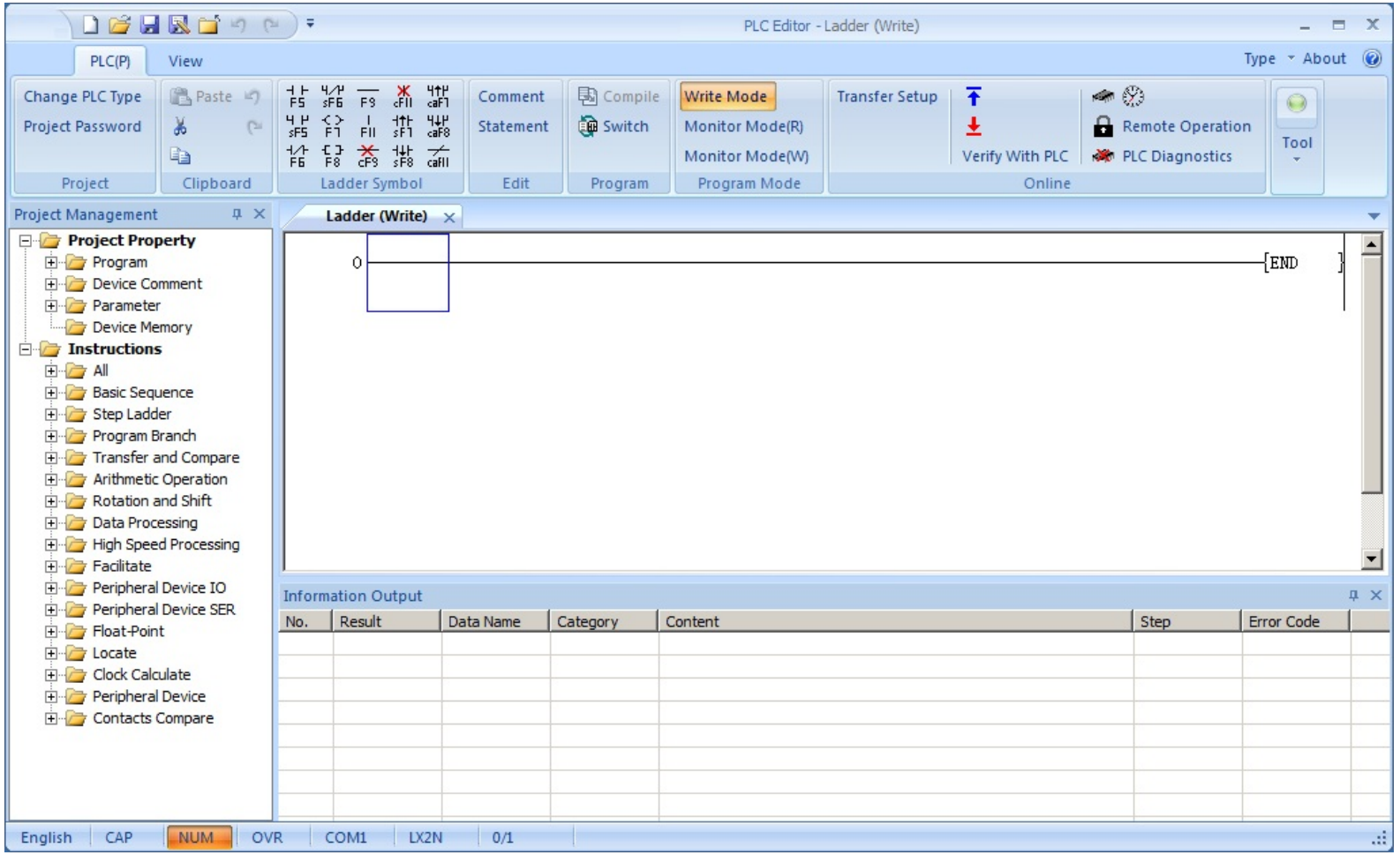
4. Waiting for new dialog box pop up

5. Select [PLC series], [PLC Type] and [programming language] by drop-down box

6. Click [OK], you can create a new project



In the example, we chose LX2N type PLC, use ladder as a program language, after complete the new project , as shown below:



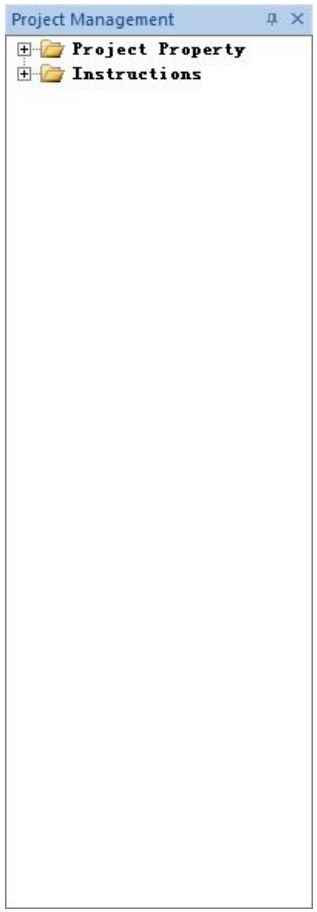
Specific project management functions, see the relevant chapters.

Add instructions

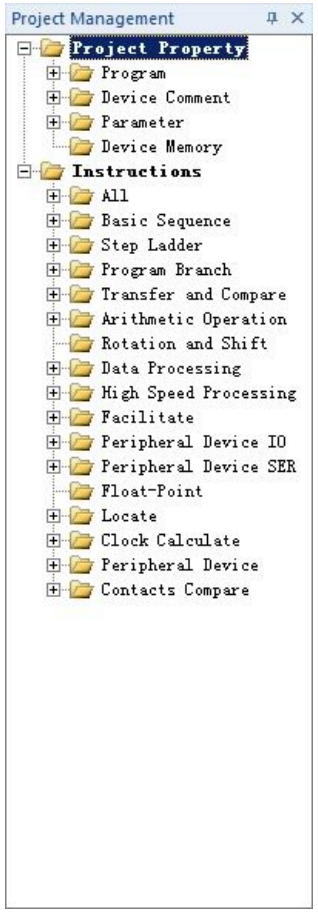
Method

1. Create a new project has been completed

2. Open the [Project Property] (Home panel on the left)

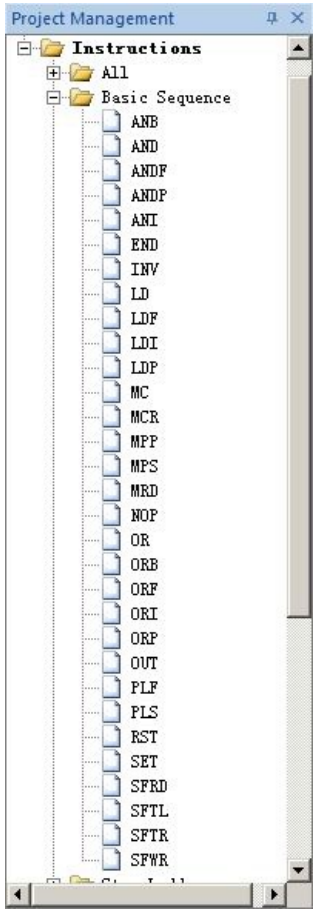


3. Expand [Project Property] directory tree

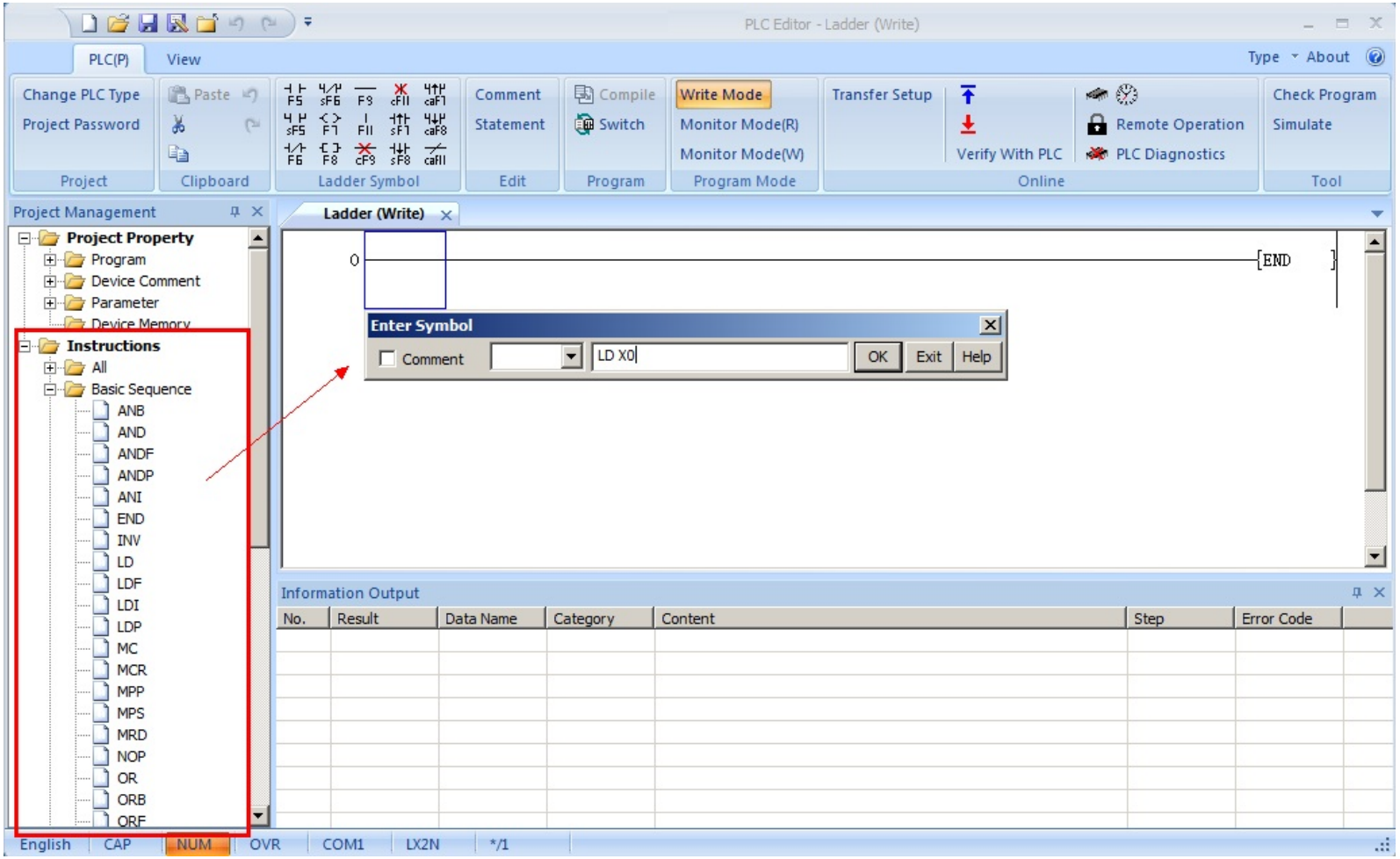


4. After expanding [Project Property], expand [Instructions]

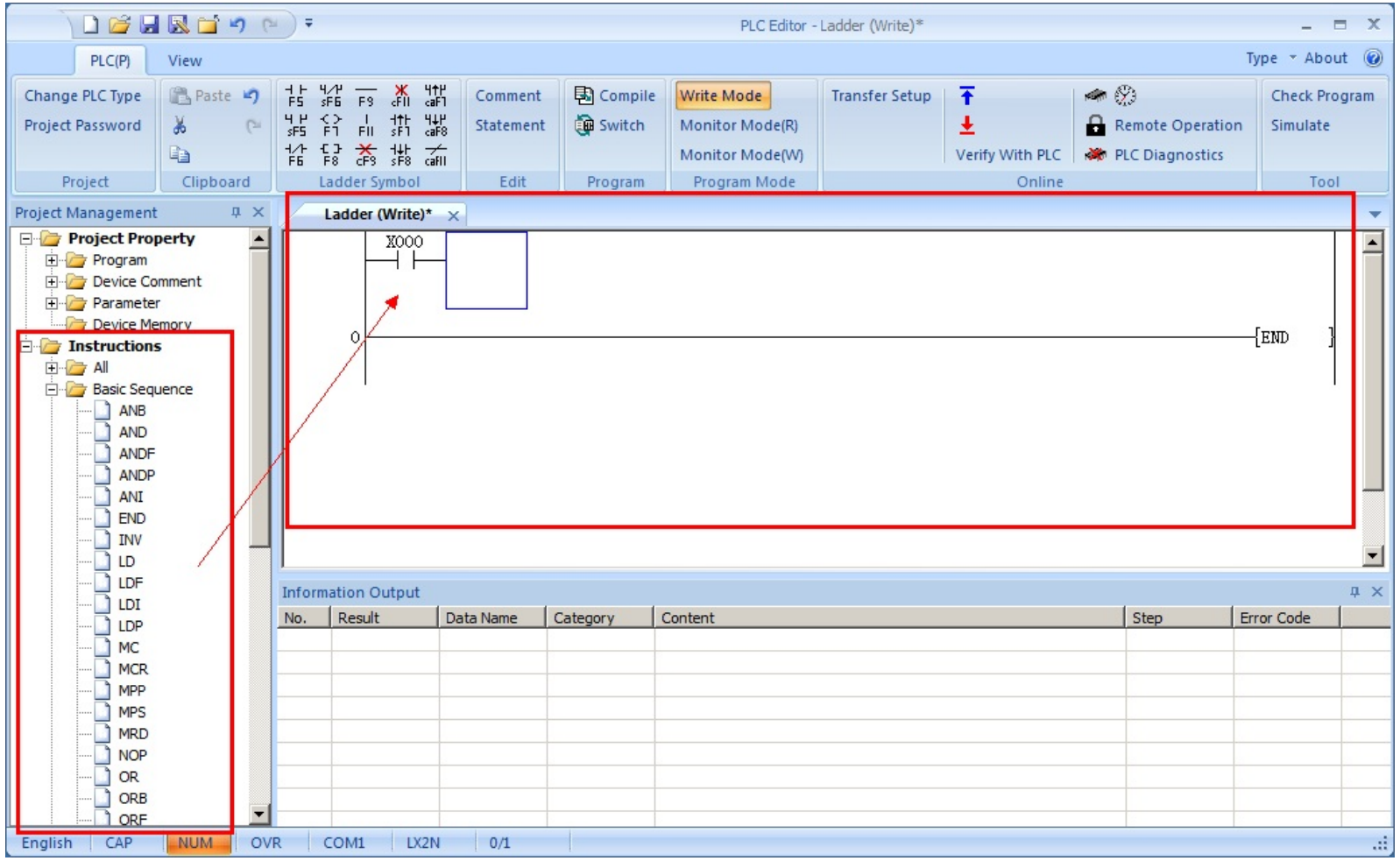
5. Expand [Basic Sequence]



6. Use the left mouse button, select the specified sequence instructions, such as [LD]



7. Press and hold the mouse button down, Select [LD], drag to the right [Ladder (write)] input box, Placed in the specified location, release the mouse button

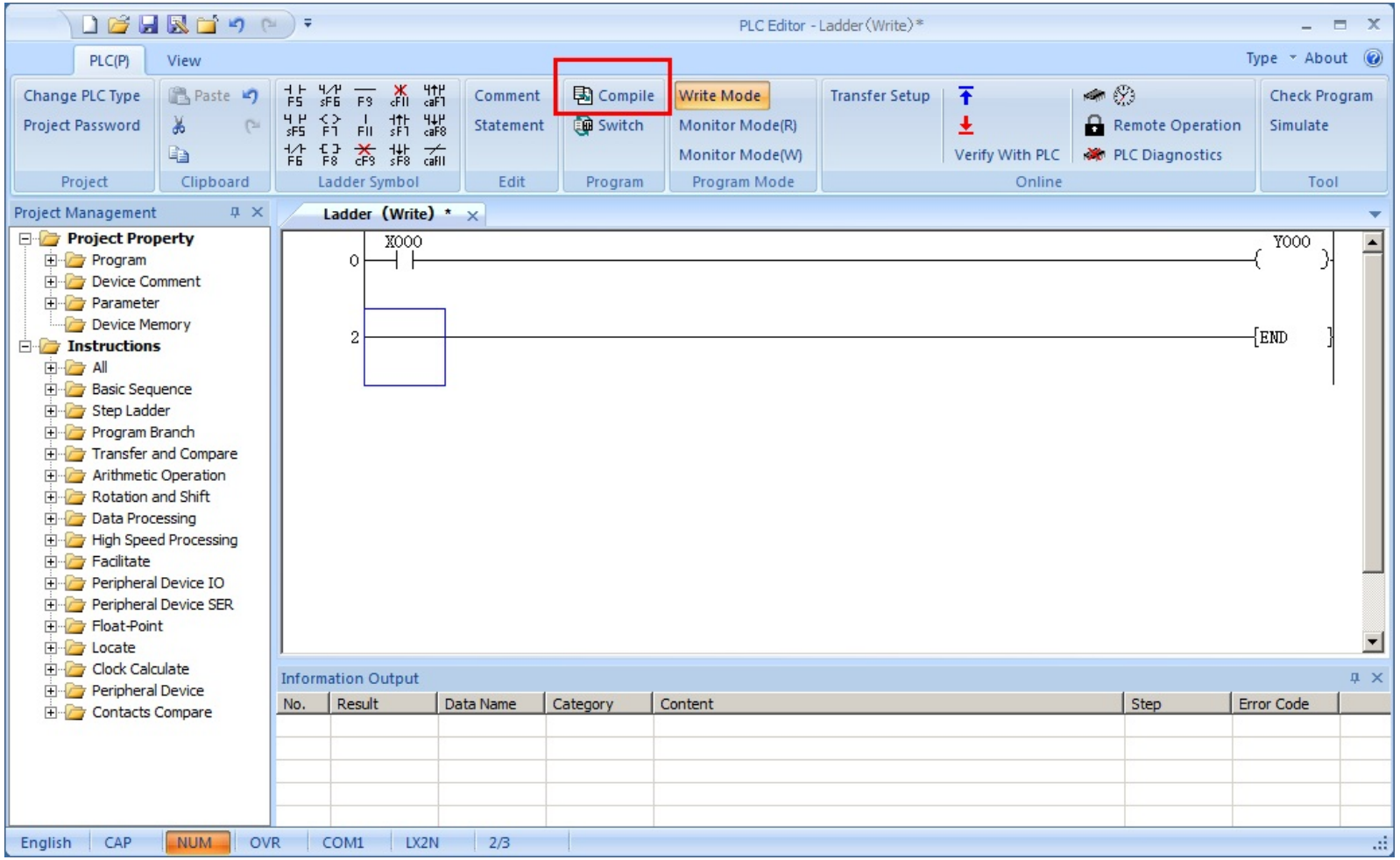


8. Note: Some instructions have been added in addition to the default parameters, the input and output is empty, the user must input parameters or component address

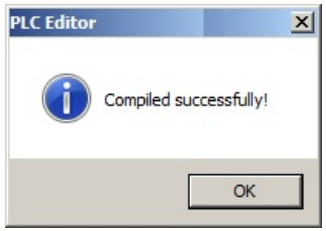
9. To add more commands, repeat the above operation until all instructions is added.

Compile Program

After completing the programming, then the project needs to be compiled and save. Through [F4] on the keyboard or program panel [Compile] button to achieve program compilation compiled, as follows:



Successful compilation will have the following tips:



All errors are displayed in the list box,users can select the specified error message,Double-click the left mouse button to specify the information, the system will automatically navigate to the location of the error or warning, to facilitate user debugger.

Note:The program only in the case of a successful compilation or no error can be downloaded to the PLC

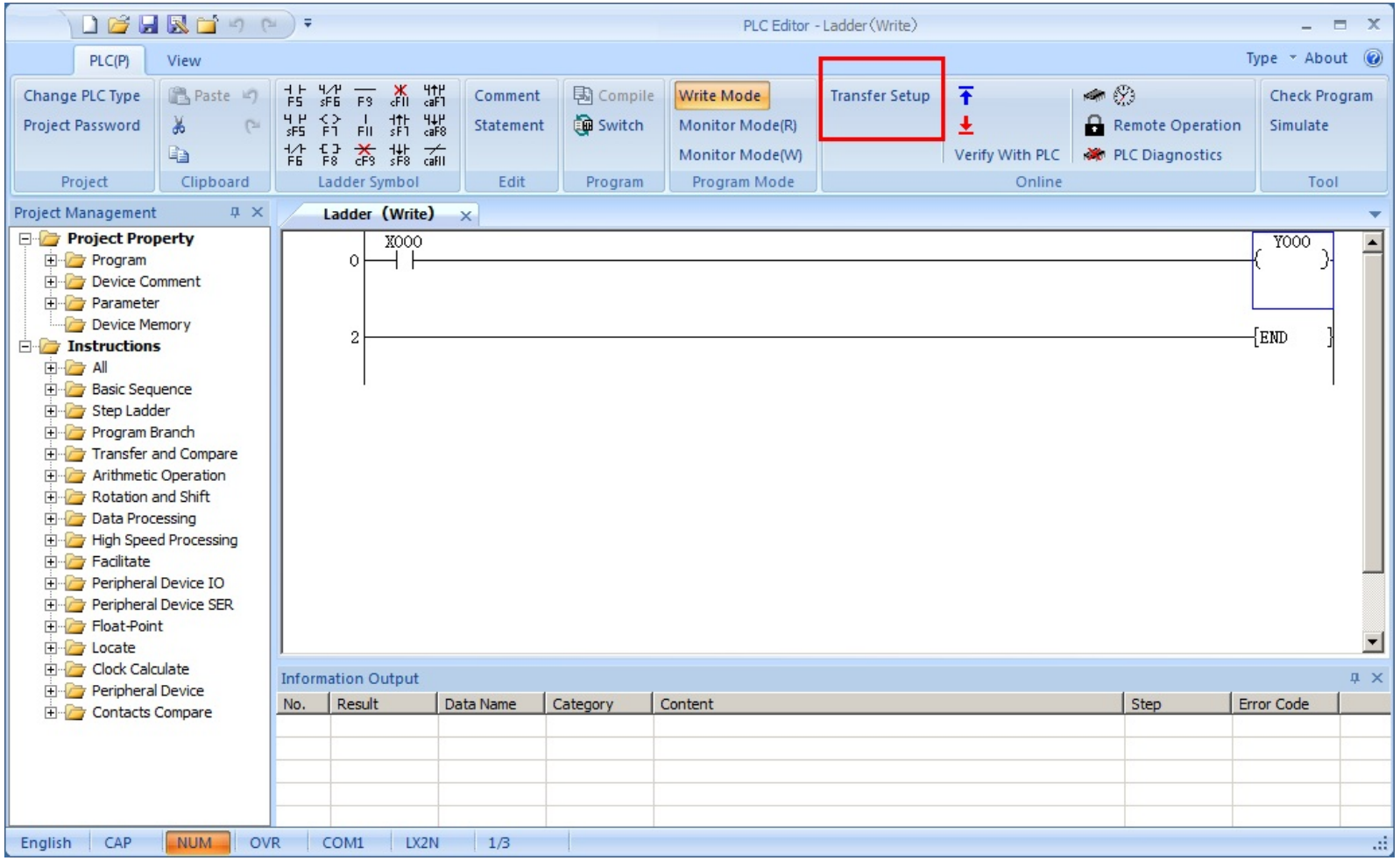
Communication test (connection with a PLC)

The main purpose of communications test is to improve the stability between the PLC and the PC, avoid lossing data of transmission.

Preparatory steps:

1. Open Run PLC Editor
2. Move the mouse on the top of the panel program modules [Online]
3. Move the mouse on the [Transfer Setup] button, left-click the button

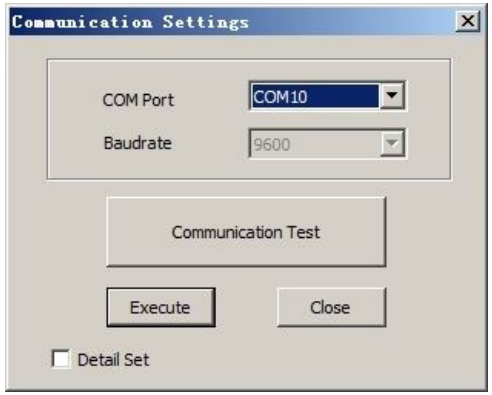
As shown below:



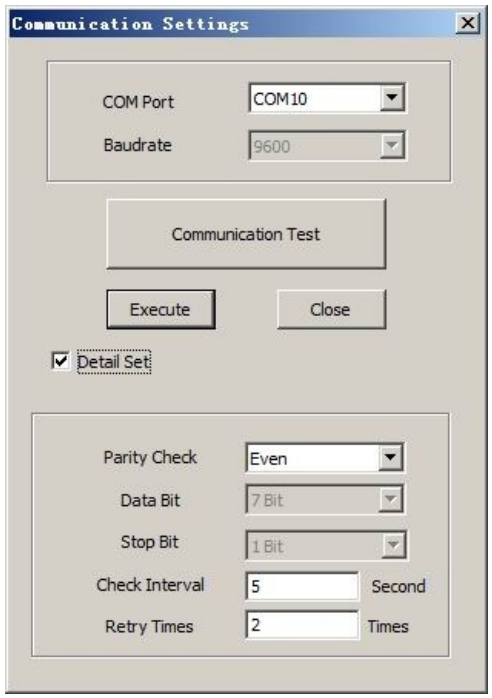
4. Wait for the program response [Communication Settings] dialog box pops up

5. [Communication Settings] dialog box pops up, In the [Detailed Settings] is not checked selection box, Panel as shown below

6. Select the specified port, as shown below



7. Select the [Detailed Settings] selection box will pop up detailed design window.Panel as follows:

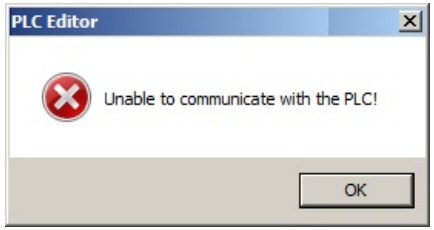


8.The data can be set according to their needs

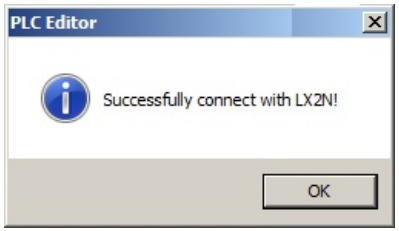
Note: The communication time is set within the range of 0 to 9999, the number of retry is set within the range of 0 to 5, do not exceed limits

9. Users complete the setup, you can click [Communication test] or [OK] button to connect the test.

10. If the test connection fails, the system will give corresponding prompt, as shown below



11. The connection is successful, as shown below



Write to PLC

Needs to be done before downloading:

1. Open Compiler.

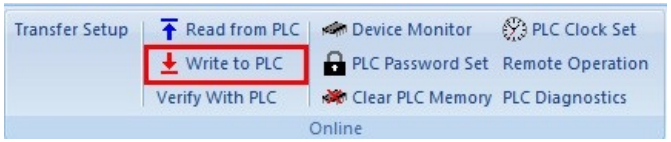
2. Create a new project, and make this project successful compilation.

3. Installed the corresponding PLC driver on PC side,connect between PLC and PC.

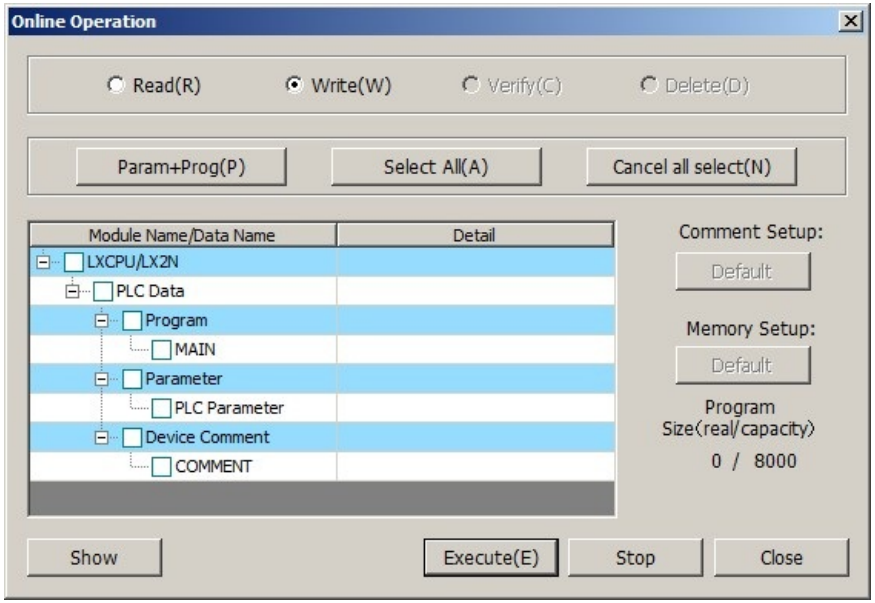
4. The communication settings.

Start download.

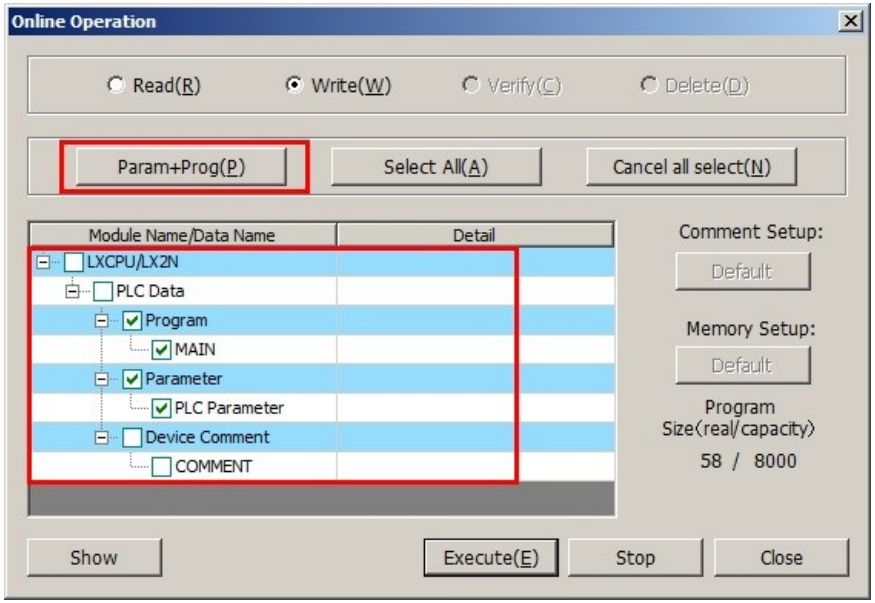
1. After the completion of preparatory work, move the mouse to the [Online] module,Click [Write to PLC] button to open the download settings window, as shown below:



2. Online operating window as shown below

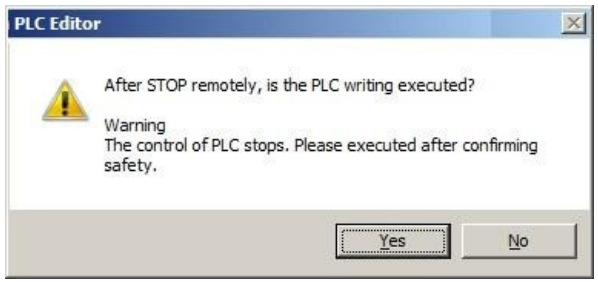


3. Click [Parameters + program (P)] button,The system will automatically select the information box preset option, after complete the configuration , click [Executive].As shown below:

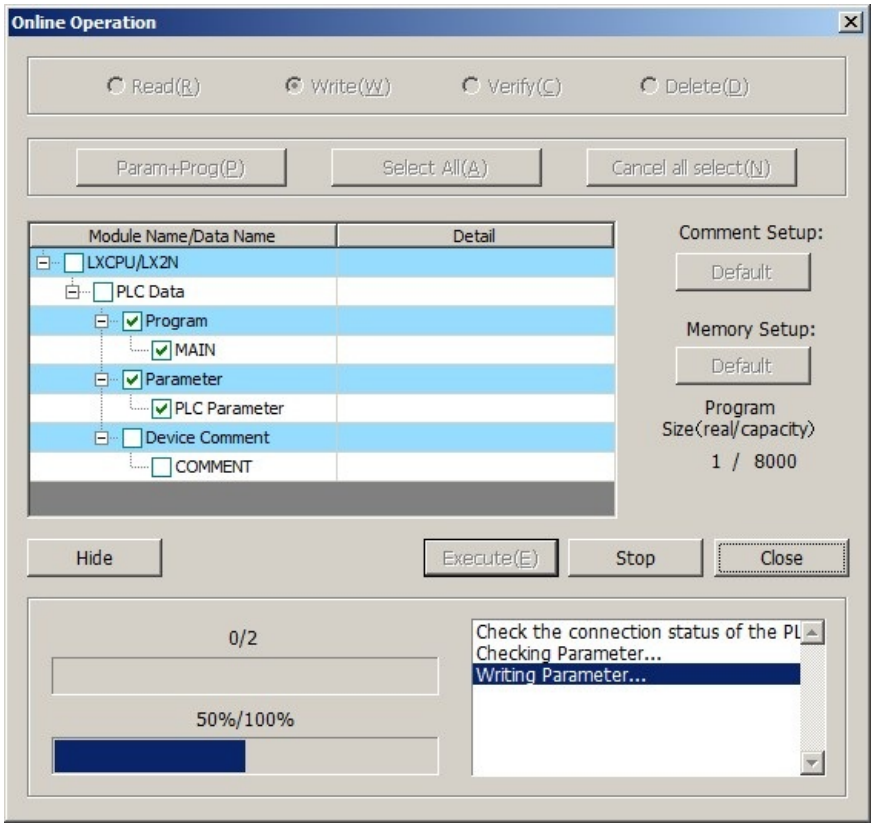


4. Click the [Executive], the system will automatically pop up window.Click [Yes] to stop the PLC means that the operation of the PLC

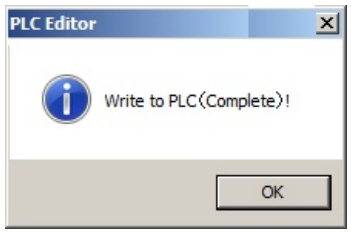
program start downloading.Click [Yes] to stop the PLC means that the operation of downloading the PLC program is starting. As shown below:



5. After clicking [Yes] the download starts running compilation window.As shown below:



6. When complete the download progress window's progress. The system will pop up a prompt [compiled successfully], As shown below:


PLC Editor
Write to PLC〈Complete〉!
OK

Program Simulation

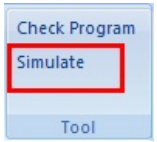
Through [online simulation] function the program, can be very convenient to carry on the work done.

Preparation:

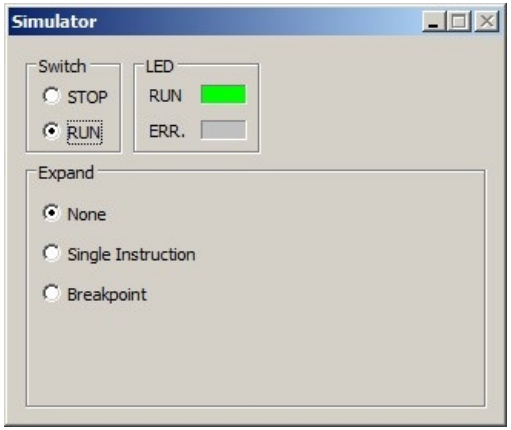
1. Enables the compiler to run
2. Prepara of a new project, and then compile

Start online simulation

1. Move the mouse pointer to the [debug] module, left-click [Analog Start / Stop}.As shown below:

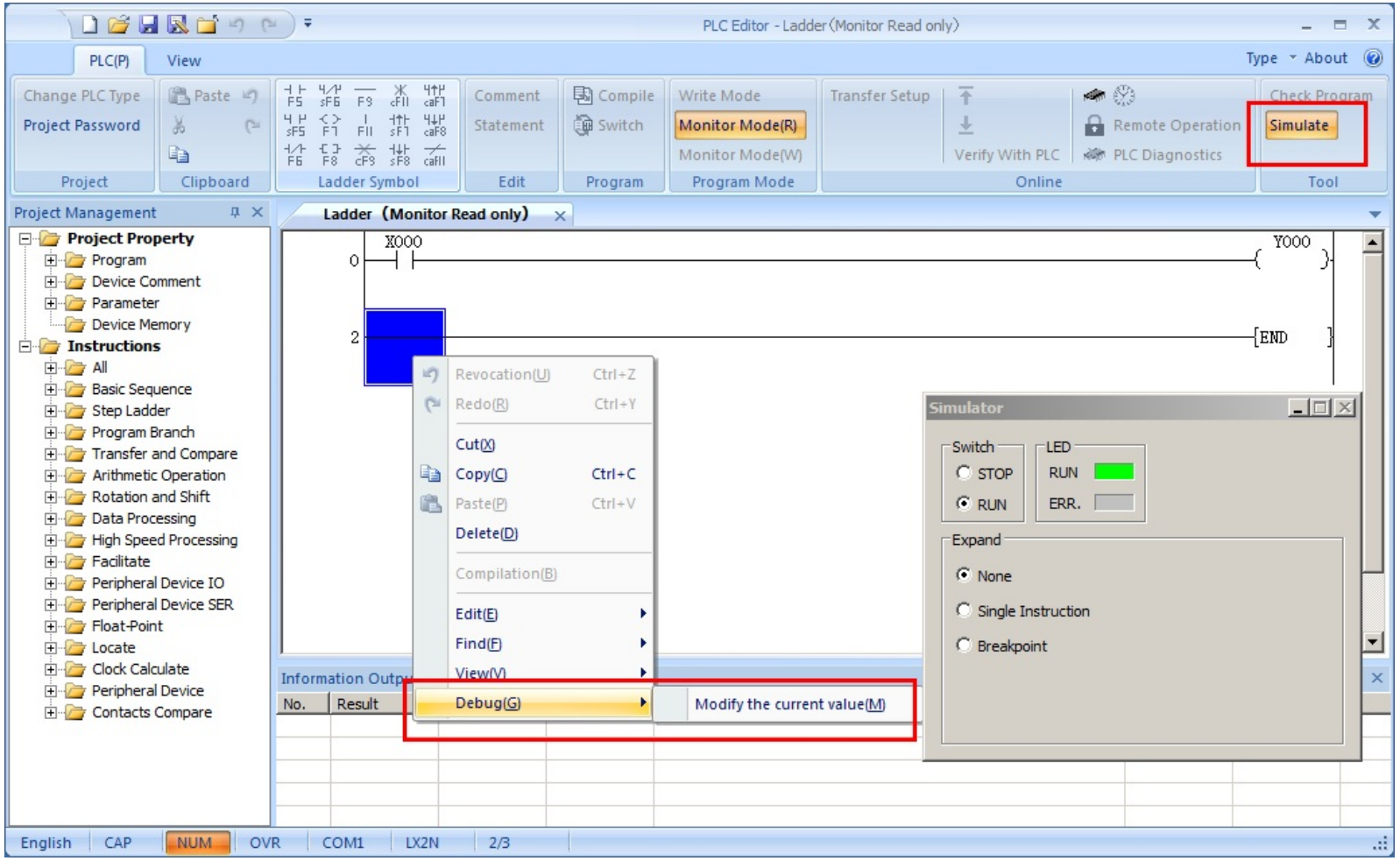


2. After step 1, a new dialog box will pop up

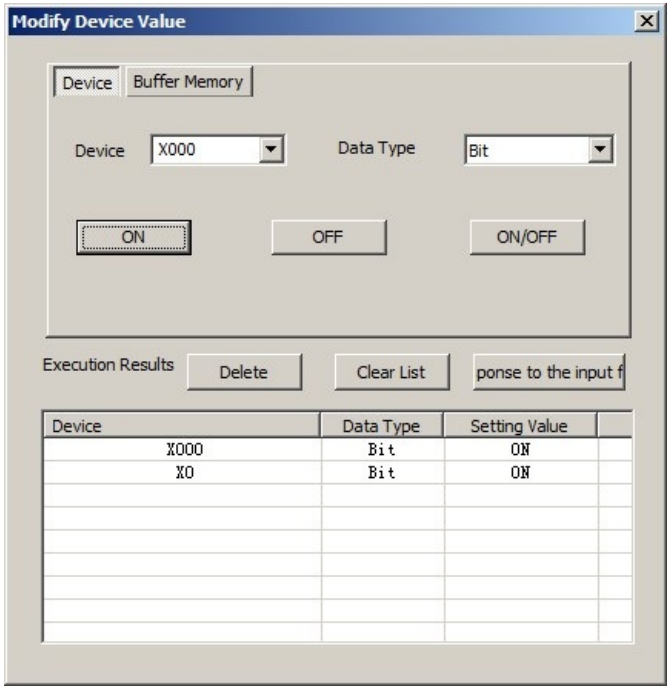


3.Do not operate the new dialog box

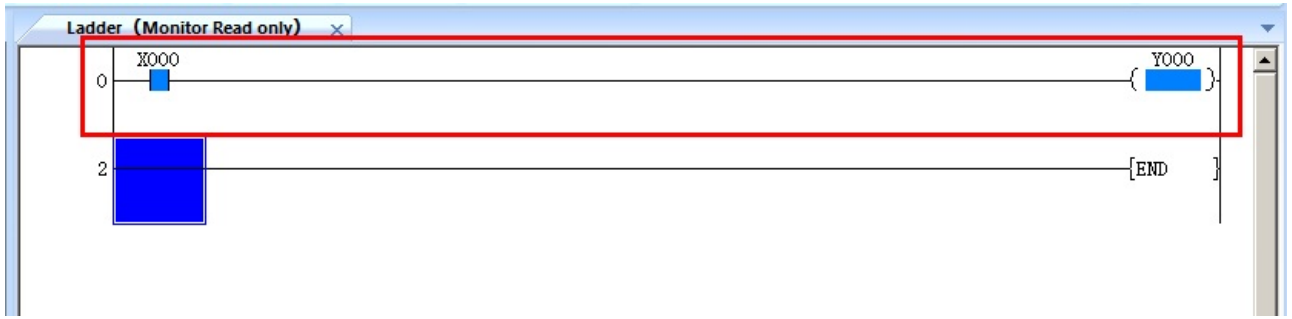
4.Move the mouse pointer to the desired position to operate the analog instruction,Right-click the specified location, select [Debug] - [Modify current value].As shown below:



5. After completing step 4, a new dialog box [modify the device value] will be pop up. At this point, given the device inputs corresponding action [ON], the specific operation as shown below:

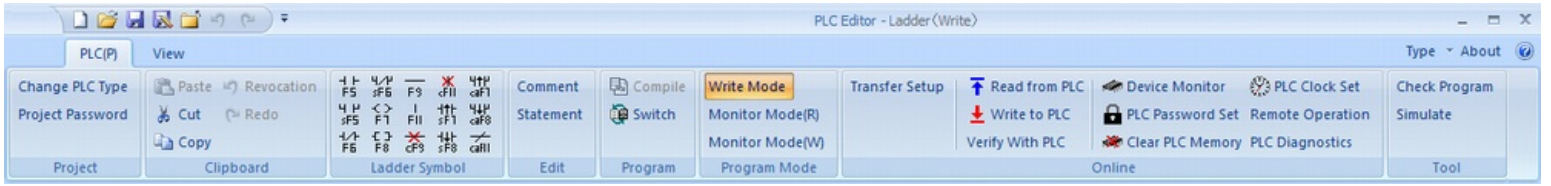


6. After completing step 5, there will be as follows



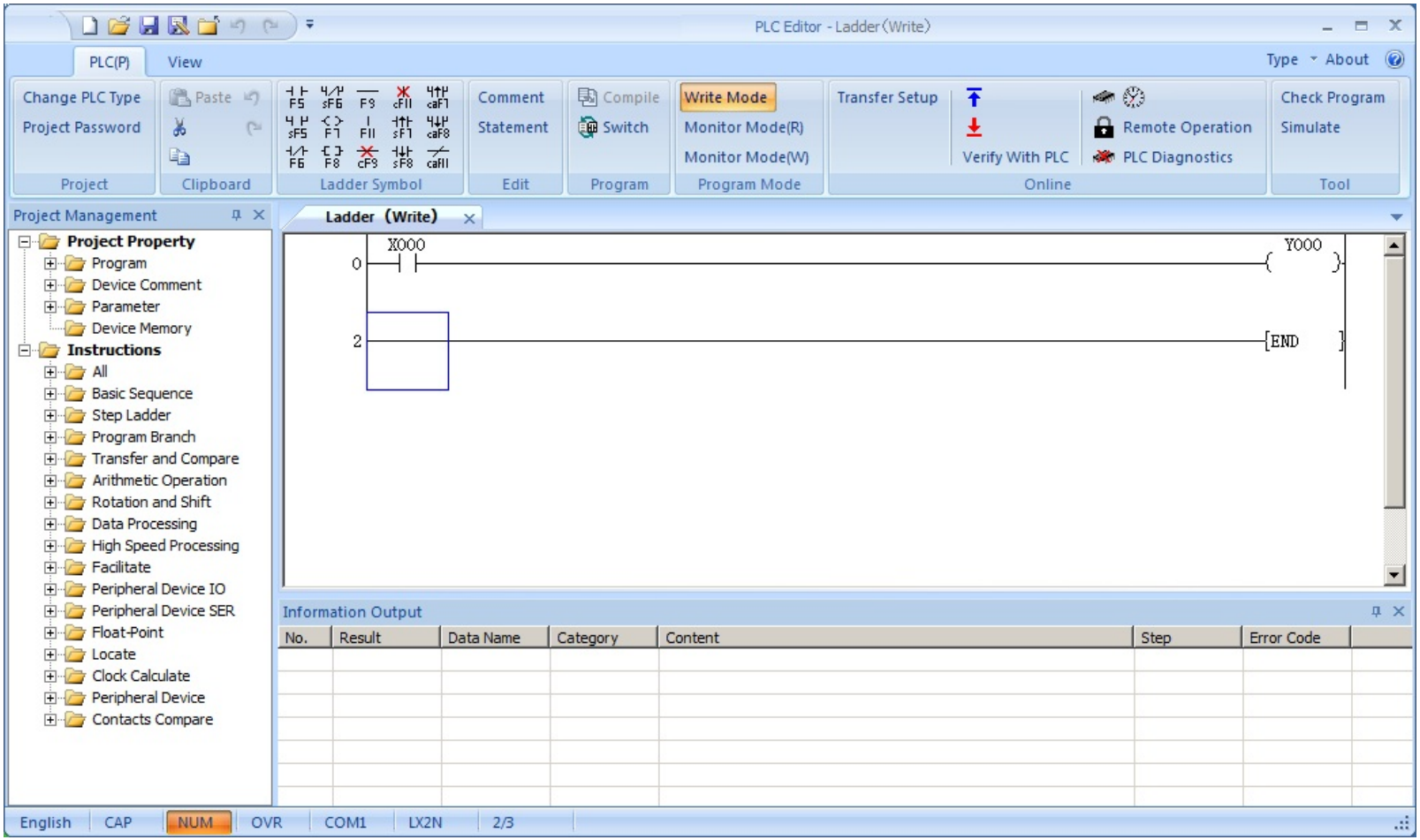
PLC menu bar

PLC Editor provides a complete and powerful functions.The menu bar is as bellow.



Introduction of integral structure

After the software start , the main interface will be show as the below figures:

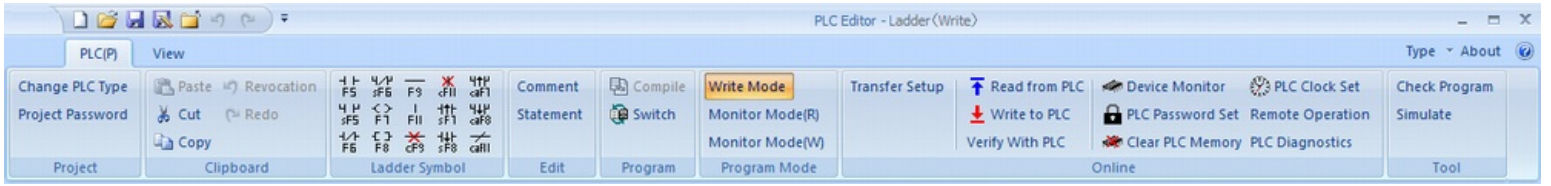


The follow is the introduction of each module.

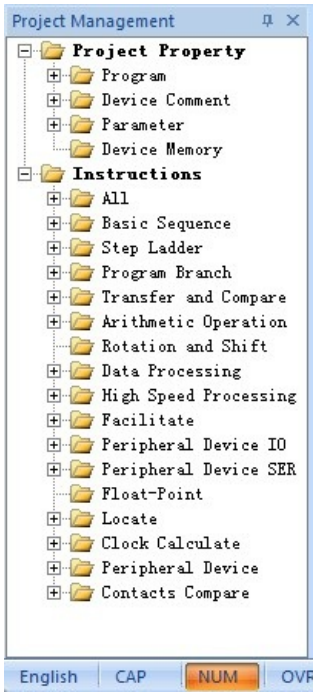
Click [File] button in the top left corner to choose these functions that include "New Project"┻"Open Project"┻"Save Project"┻"Save as engineering" and "Print".

Strip area at the right of [File] button is [QuickAccessBar]. Keep the cursor on the button for 1 second. The fuction of the button will be shown automatically.

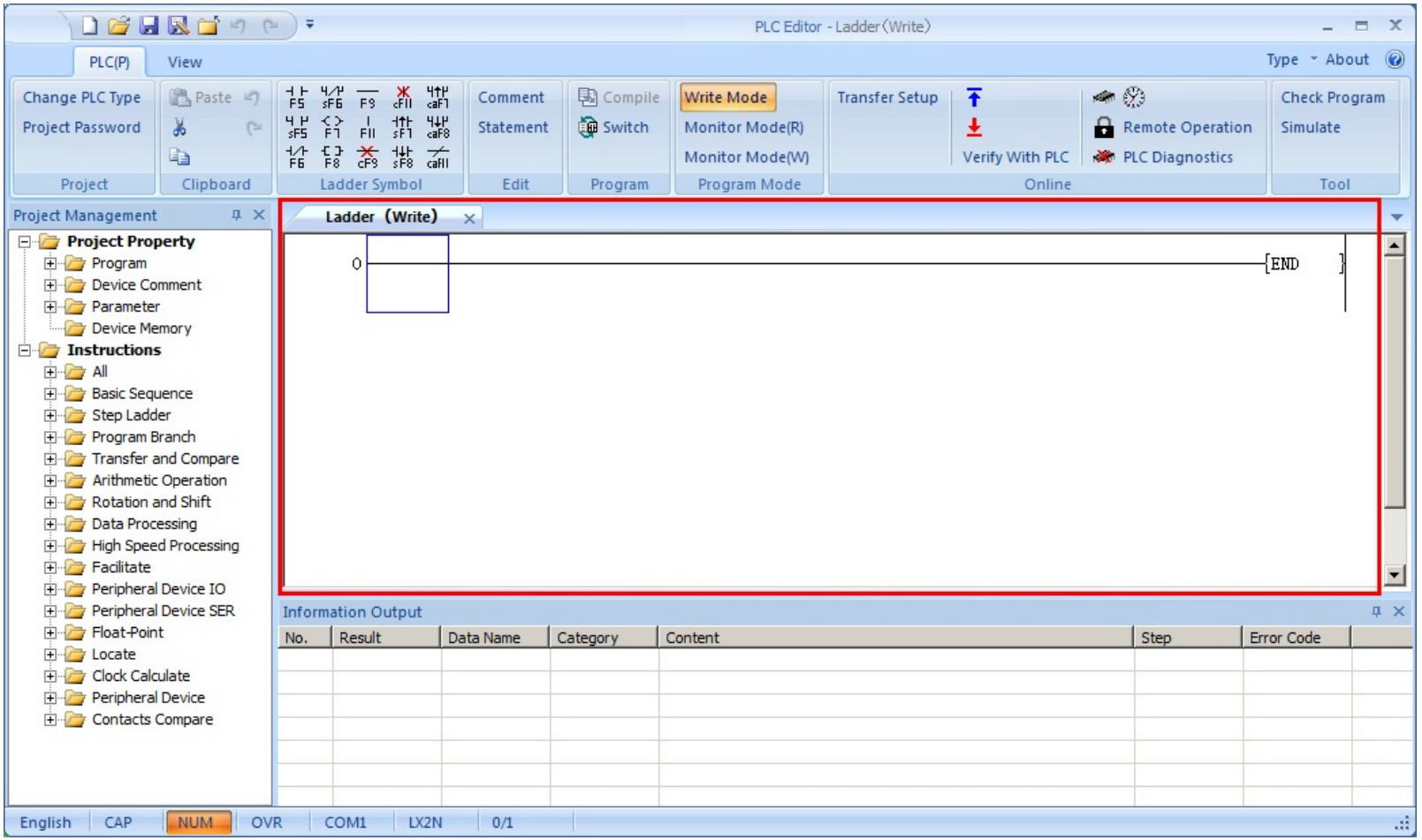
The figure is [Menu toolbar]. It become convenient to users for various operation. Specific operation can be seen as the below instructions.



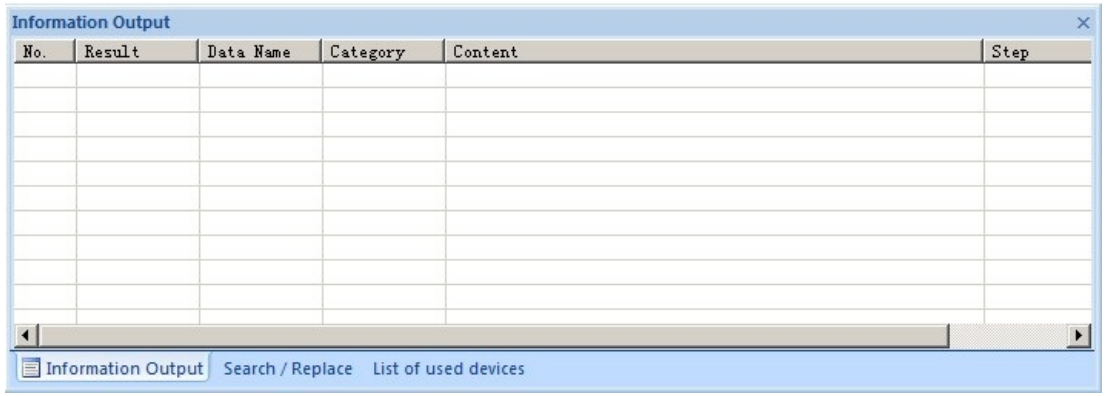
The left side of soft panel is [Engineering management panel] .Engineering management panel show the entire project through the tree. The project include organization structure, project name, program block, device annotation, parameter;all kinds of instruction table and so on. Users can control the whole project by [Engineering management panel]. And [Engineering management panel] Supports the use of right button function. As the below:



[User area] : In short, it is developed module. User can write programs and configure the Plc in the module⊐and so on. User can delete, change, find the plc by the moudle.

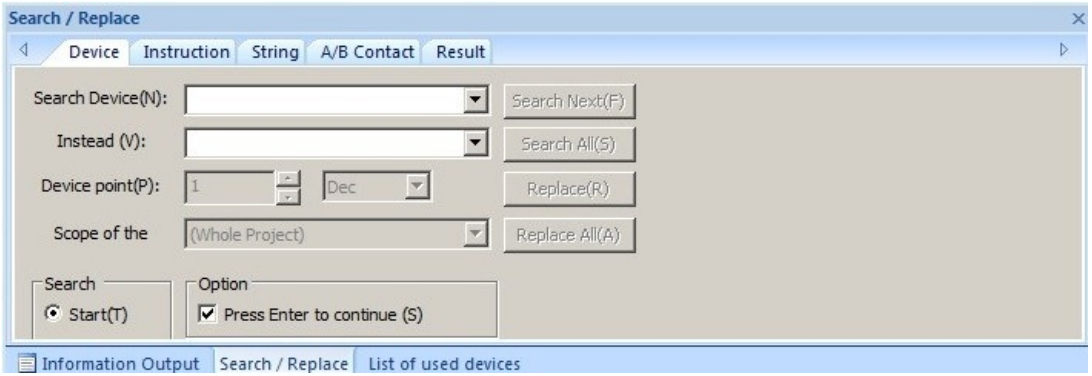


[Ouput window] : The window shows all information of the current construction. It shows all the error messages.User can select the specified message about automatic positioning and the designated area.



[Status Bar] : It is Used to display the status of current software. So that users know the situation in a timely manner.

[Find/replace Windows] through [Ctrl] + [F4] to open the window. Under project there is a large amount of code, according to that user enter instruction to automatic matching engineering. Thus to quickly locked the specified item.



Shortcut Toolbar

A menu is consisted of a set of submenus that contain the complete commands.

When the mouse is hovering on a menu item, a brief description about the function of this menu item will be displayed in the status bar. All the submenus will be further explained about the application in the subsequent sections. Submenus are listed as below (note: the items of these submenus might vary slightly depending on the program functions).

Custom Toolbar

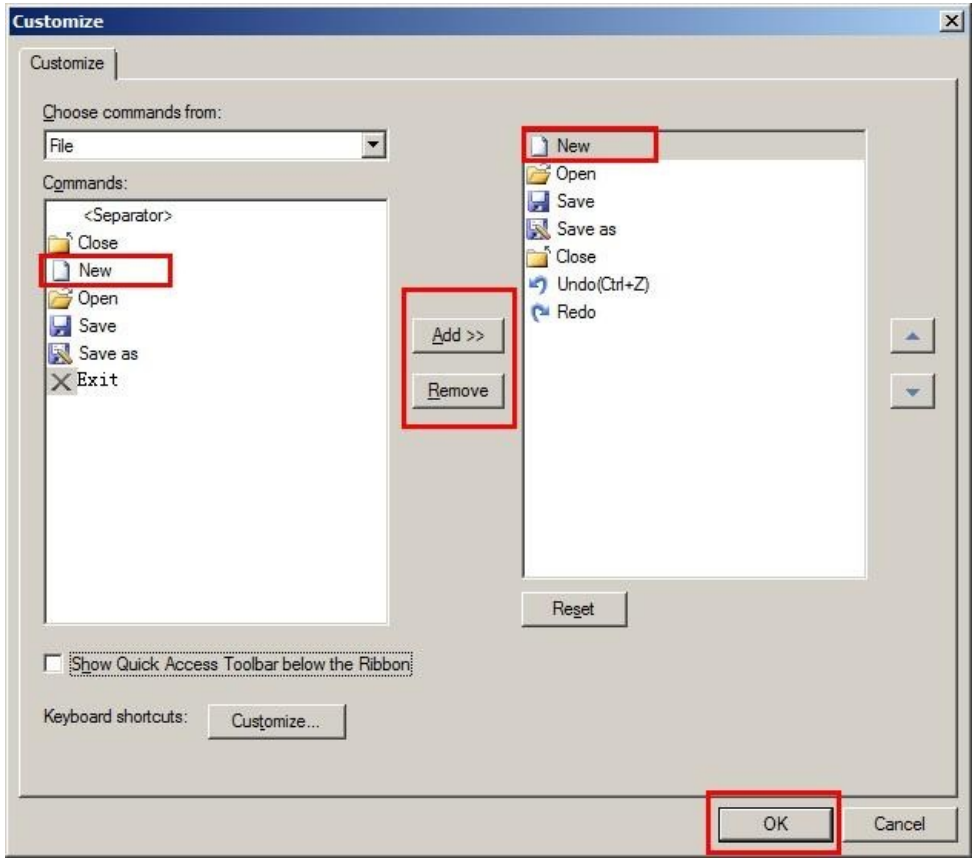
1. Users can more easily customize the functionality as what they need by using the [Quick custom toolbar] .

2. After open the combobox, select the [more command] .

3. After completing Step 2, then open the [custom] window .

4. Add Shortcut : Select a any command in the [command] box on the left side. Then click [Add] so that you will find the selected item moves to the right box . And click [OK] can successfully add a custom tool .

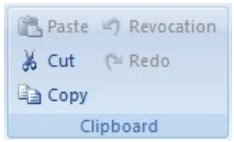
5. Delete Shortcut : Select any command in the [command] box where the right side. Then click [Delete] so that you can find selected items in the right dialog box disappears .Click [OK] to complete delete the command .


Customize
Customize
Choose commands from:
File
Commands:
<Separator>
Close
New
Open
Save
Save as
Exit
Add >>
Remove
New
Open
Save
Save as
Close
Undo(Ctrl+Z)
Redo
Reset
Show Quick Access Toolbar below the Ribbon
Keyboard shortcuts:
Customize...
OK
Cancel

Clipboard Toolbar

The clipboard toolbar contains the basic functions commonly used to edit a PLC program.This chapter will explain the basic instruction of the clipboard.

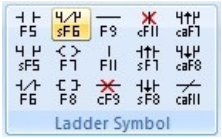
For example : CUT, COPY, PASTE, UNDO/REDO



1. Cut : The cut command removes the selected data from its original position .
2. Copy : The copy command creates a duplicate .
3. Paste: Transferring text, data, files or objects from a source to a destination .
4. Undo : It erases the last change done to the document reverting it to an older state .
5. Redo : The redo command reverses the undo or advances the buffer to a more current state.

Ladder-Chart Toolbar

The ladder-chart toolbar contains the functions commonly used to edit ladder-charts.



As illustrated below :

Icon	Instruction	Function	Shortcut
F5	LD AND	Open contact	F5
sF5	OR	Open branch	SHIFT+F5
F6	LDI ANI	Close contact	F6
sF6	ORI	Close branch	SHIFT+F6
F7	OUT	Output coil	F7
F8		Input application instruction	F8
F9		Draw horizontal line	F9
F11		Draw vertical line	F11
cF9		Delete horizontal line	CTRL+F9
cF11		Delete vertical line	CTRL+F11
sF7	LDP ANP	Rising pluse	SHIFT+F7
sF8	LDF ANF	Falling pluse	SHIFT+F8
caF7	ORP	Rising pluse open branch	CTRL+ALT+F7
caF8	ORF	Falling pluse close branch	CTRL+ALT+F8
caF11	INV	Reverse operation resoults	CTRL+ALT+F11

Edit Comment or Statement

In order to increase readability, this software allows user to add network comments for the codes in the current network.

Note : Win7 need administrator privileges to run

As figure below , Enter edit mode :

Specific edit mode

Edit comment

1. Prerequisite : create a new project , write at least one piece of code.

2. Click [comment] button, you are enter the edit mode when the button color darker.

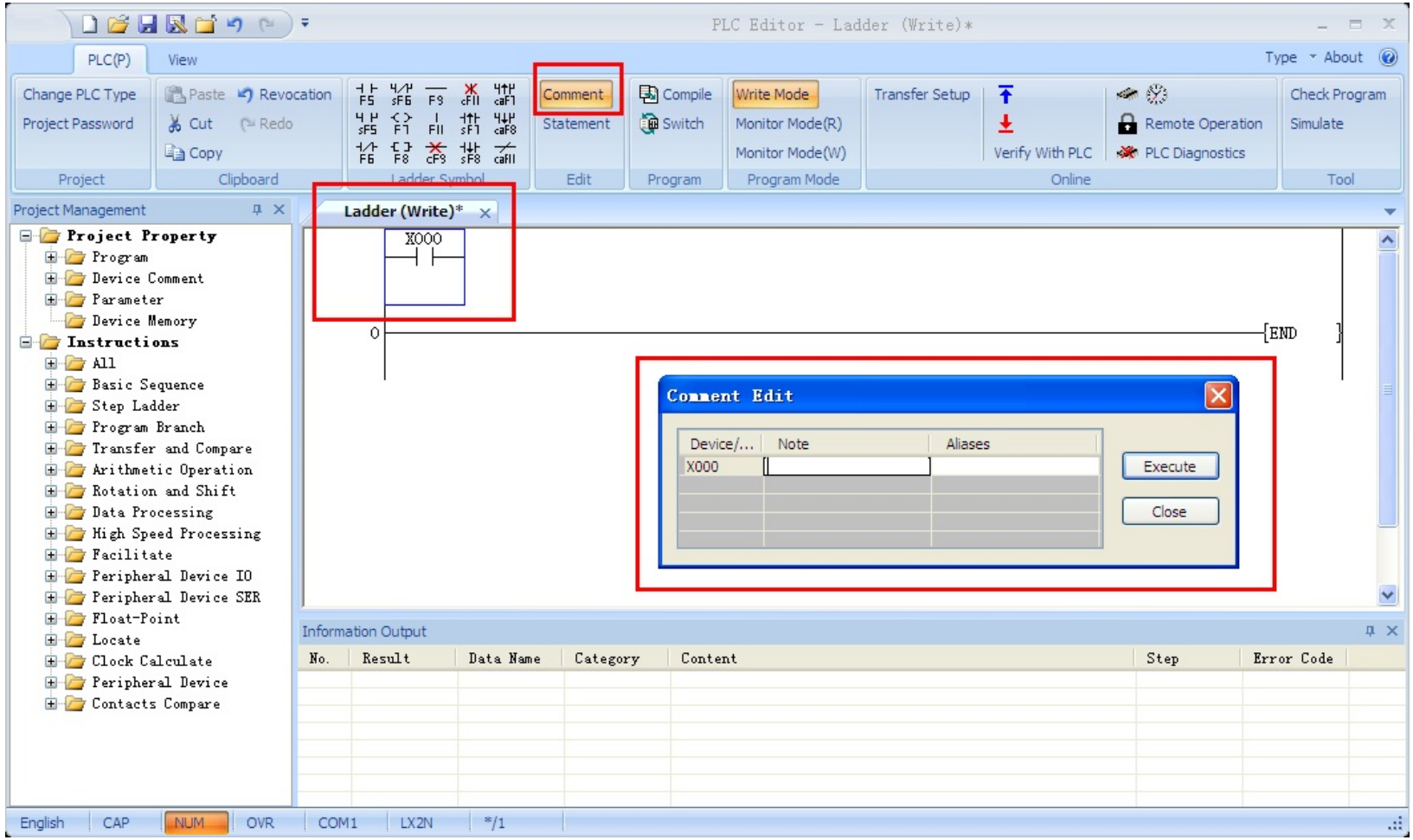
3. If the button is not changed , then save the current project and rerun the software with administrator privileges .

4. After successfully into the edit comment mode, Move mouse to the user specified code , Next, It can pop-up [comment edit] window when you double-left click on the target area .

5. At this time you can input specified comment to [comment edit] window .

6. Note: Comments only can display 27 characters maximum , After the download, display 16 characters maximum.

7. After edit the comments, click [sure] to save.



Edit statement

Prerequisite : create a new project , write at least one piece of code .

Click [statement] button, you are enter the edit mode when the button color darker.

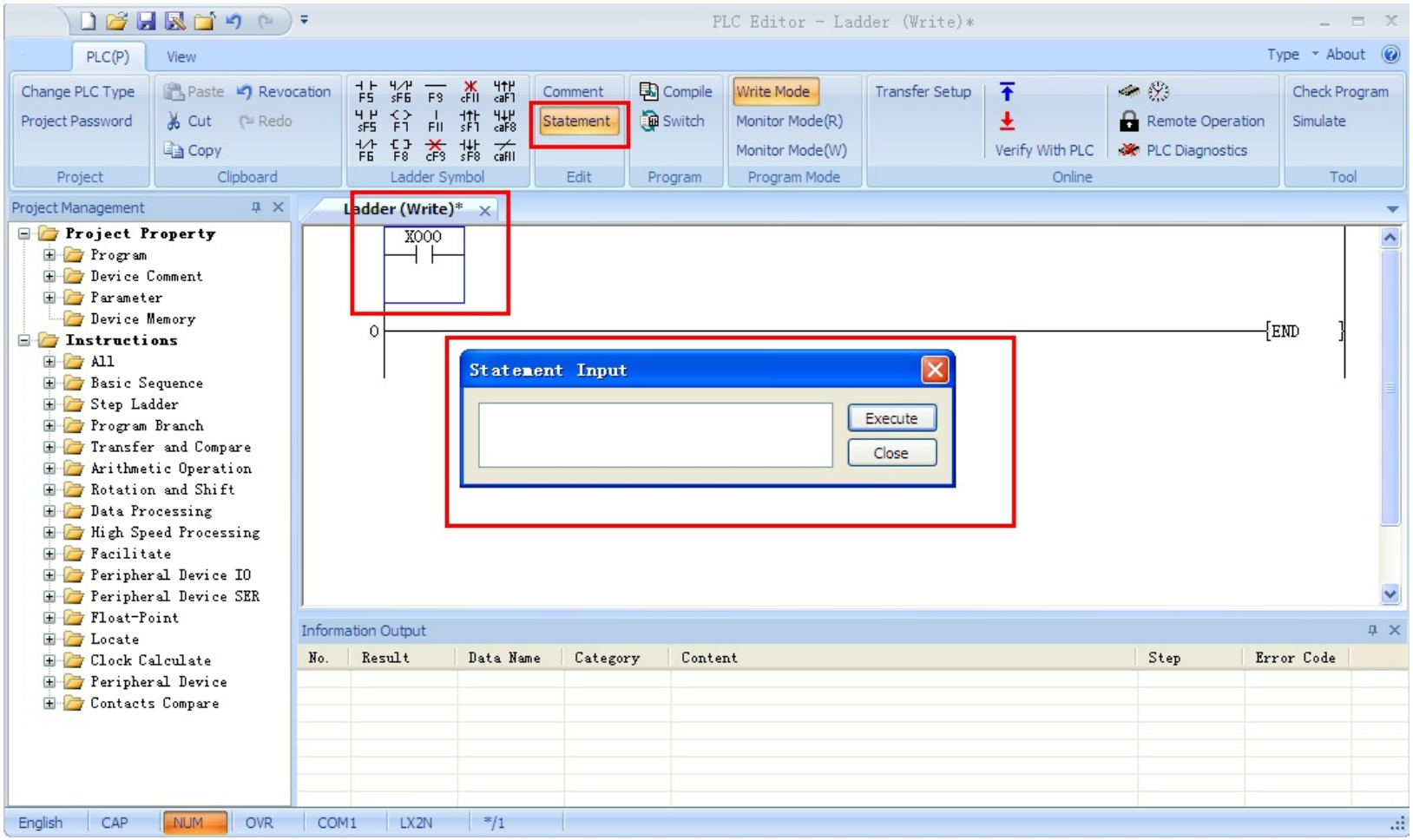
If the button is not change , then save the current project and rerun the software with administrator privileges .

After successfully into the edit statement mode, Move mouse to the user specified code , Next, It can pop-up [statement input] window when you double-left click on the target area .

At this time you can input specified statement to [statement input] window .

Note: The statement can not be downloaded into the PLC, the declared input is no word limit.

After editing the statement, click [sure] to save.



Program Compile

This chapter will explain the basic function of the program compiler.

Compiler menu has two functions, one is the program compiled the other is program to switch, As figure below :

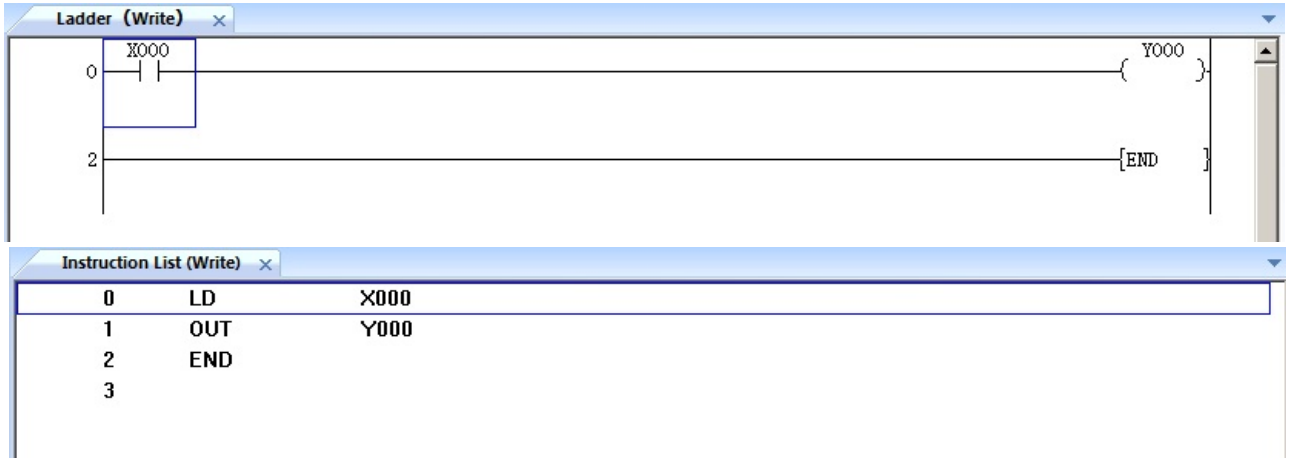
Compile : When the ladder editing is complete, it must be compiled then they can write to PLC.

Switch : Switch program view between ladder/instruction list .

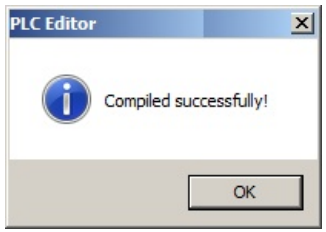
Operation :

1. Click [Compile] to compile.
2. You can also click directly on the keyboard [F4] to compile

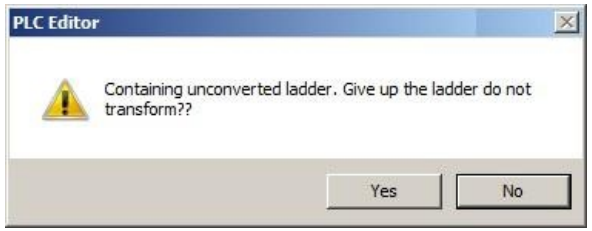
As figure below :



After editing, click [Compile] button or [F4] on the keyboard then program will be successfully compiled . As illustrated below :

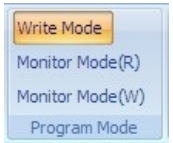


Note : Complete compile before you convert ladder to instructions list , otherwise there will be as shown below :

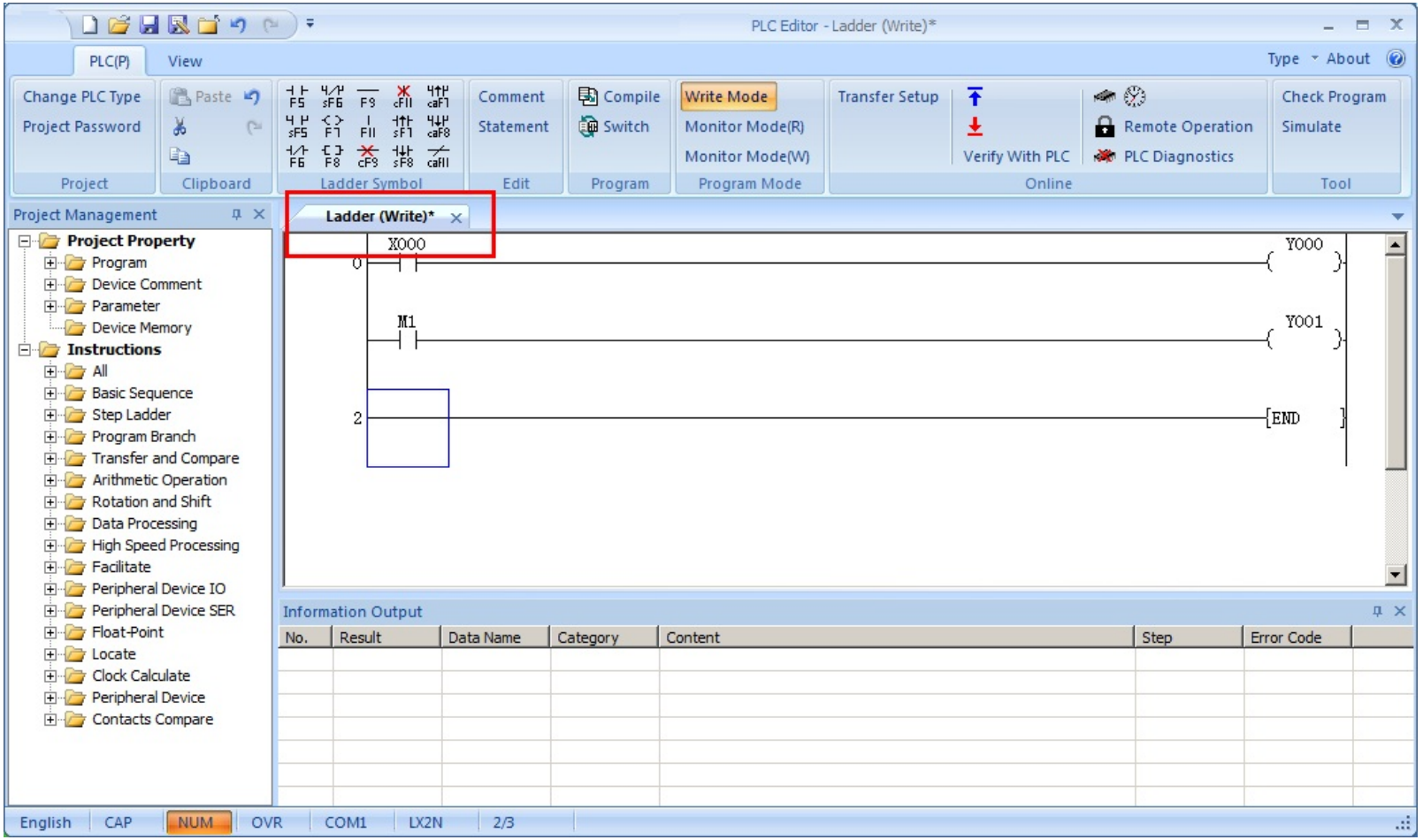


Program Function

Program mode is mainly divided into [write mode] and [monitor] , [write mode] by default.

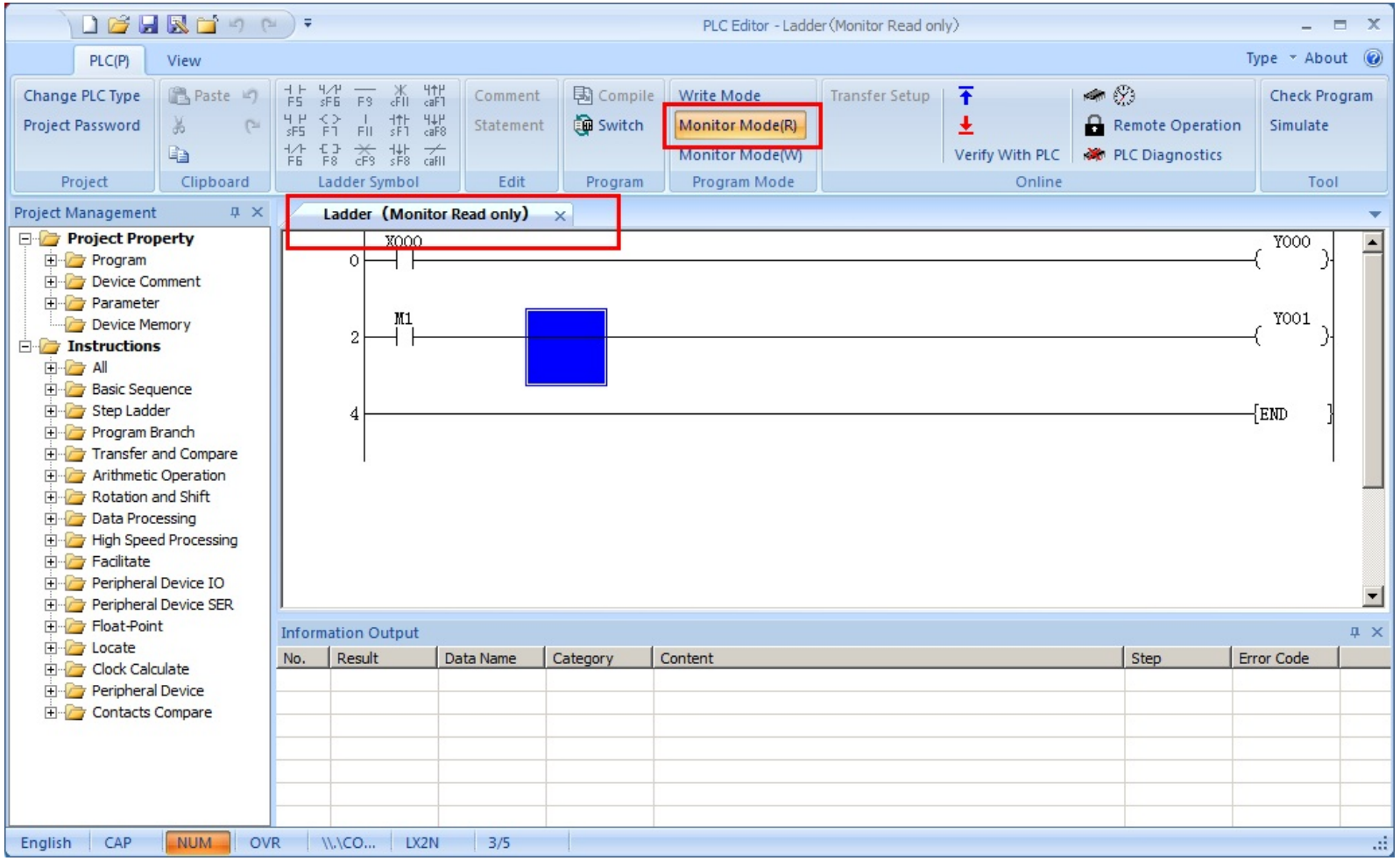


[Write Mode] : Editable ladder or instruction list.



[Monitor] チYou can do online monitoring to debug the project compiled.

Note: This mode requires to connect with the PLC while project need to match the PLC and project must be written into, Otherwise just change to the PLC existing projects value.

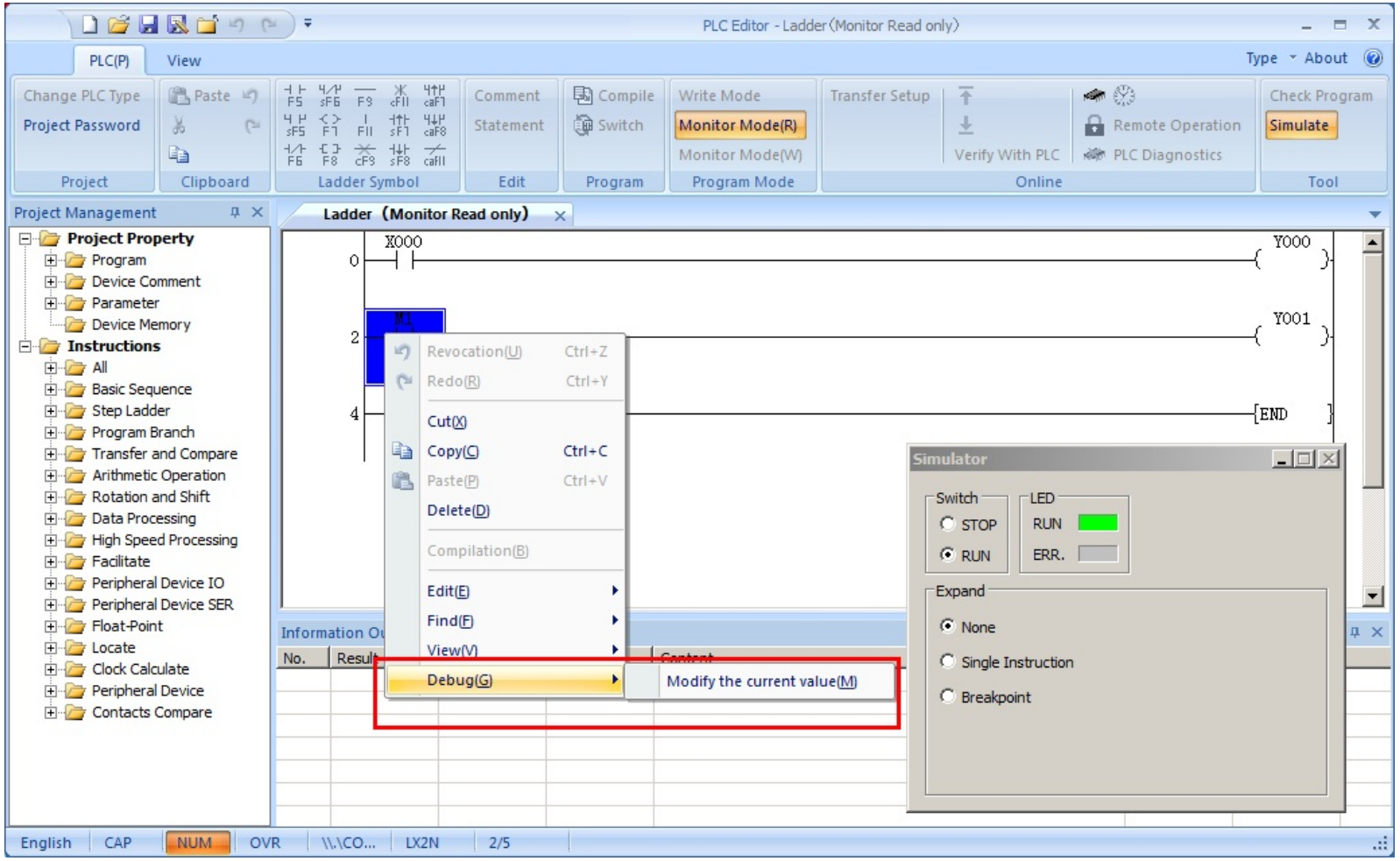


Monitor mode : Device value can be modified ;

/ Move the mouse cursor to a specified area ;

√ Right-click the target, click [debug] ll [modify the current value] ;

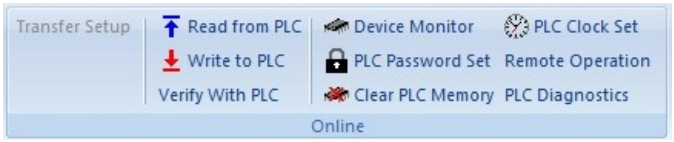
∝ The [Device Monitor] to modify device values .


PLC Editor - Ladder〈Monitor Read only〉
PLC(P)
View
Type
About
Change PLC Type
Project Password
Project
Paste
Clipboard
Comment
Statement
Edit
Compile
Switch
Program
Write Mode
Monitor Mode(R)
Monitor Mode(W)
Program Mode
Transfer Setup
Verify With PLC
Remote Operation
PLC Diagnostics
Online
Check Program
Simulate
Tool
Project Management
Project Property
Program
Device Comment
Parameter
Device Memory
Instructions
All
Basic Sequence
Step Ladder
Program Branch
Transfer and Compare
Arithmetic Operation
Rotation and Shift
Data Processing
High Speed Processing
Facilitate
Peripheral Device IO
Peripheral Device SER
Float-Point
Locate
Clock Calculate
Peripheral Device
Contacts Compare
Ladder (Monitor Read only)
X000
Y000
Y001
END
Revocation(U) Ctrl+Z
Redo(R) Ctrl+Y
Cut(X)
Copy(C) Ctrl+C
Paste(P) Ctrl+V
Delete(D)
Compilation(B)
Edit(E)
Find(F)
View(V)
Debug(G)
Modify the current value(M)
Information Ou
No.
Result
Content
Simulator
Switch
STOP
RUN
LED
RUN
ERR.
Expand
None
Single Instruction
Breakpoint
English
CAP
NUM
OVR
LX2N
2/5

Online toolbar

The Online toolbar provides the functions most commonly used to operate and access the PLC hardware, including the start/stop control of the PLC, the upload/download of the programs, monitoring, etc.

Online menu is divided into 9 parts:

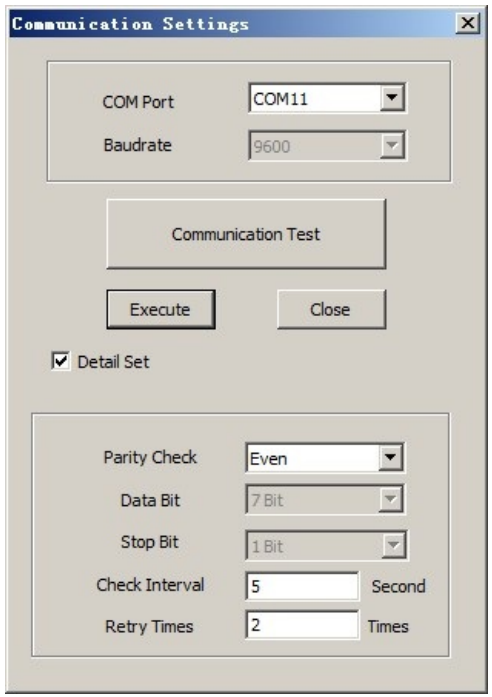


Quick Links

Transfer Setup PLC Upload PLC Download Device Monitor PLC Password Set Clear PLC Memory PLC Clock Set Remote Operation PLC Diagnostics

Transfer Setup

Transfer Setup is used to set the communication parameters, It is a important function of PLC and PC connection.



Interface label

- COM PortチMaking PLC connection with PC , You can query port in the [port (COM and LPT)] in the [Device Manager].
- Baud RateチLX1S, LX2N default baud rate is 9600b/s which can not be changed.
- Parity Check : Select in "odd"ㅗ"even"ㅗ"none" .
- Date BitチSelect in 7bit or 8bit .Usually can not be changed .
- Stop BitチSelect in 1bit or 2bit . Usually can not be changed.
- check interval : Set any time to check
- Retry time : Set the number of retry the connection

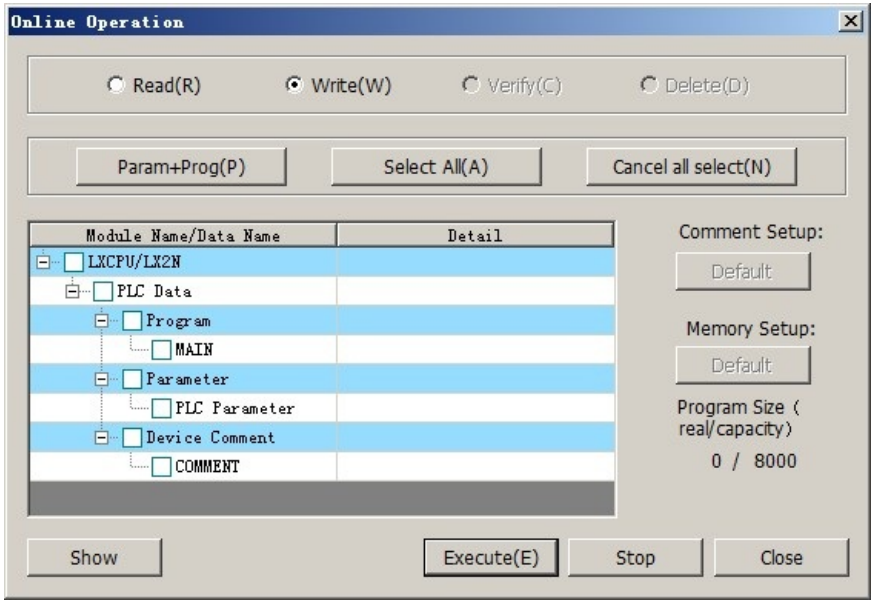
Interface Button Description

- Comunication Test : To test whether the selected port allows the PC to connect with the PLC .
- Execute : Save the current parameter configuration and close the window .
- Close : Do not save the current configuration, close the current window without making changes

PLC Upload

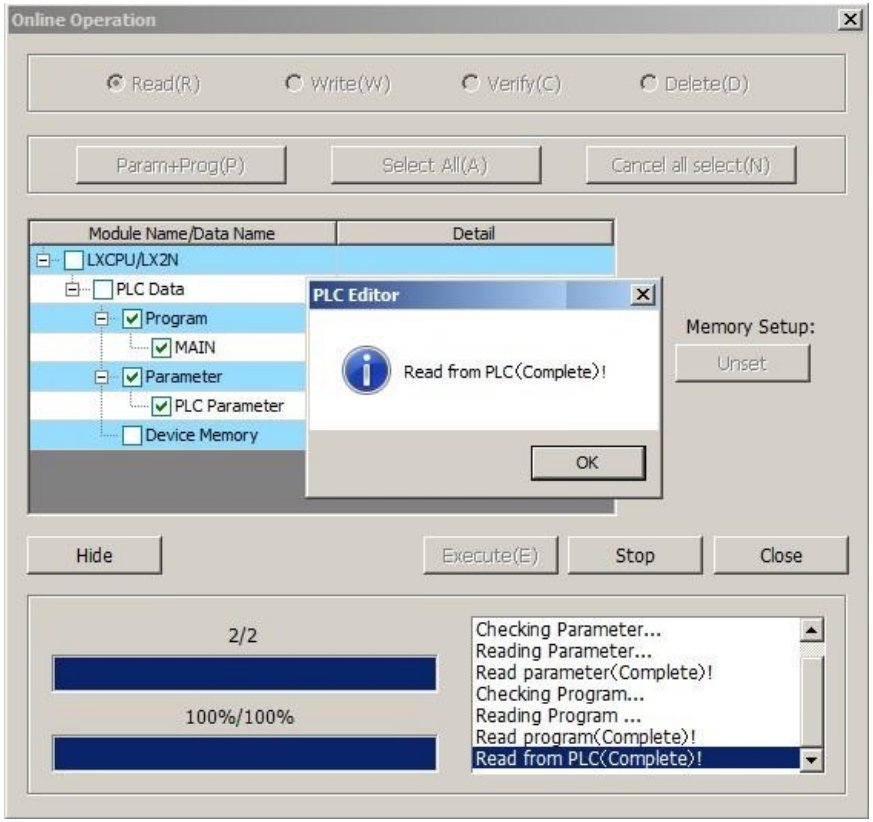
PLC Upload : The LX series PLC is through the communication line transmit data to the PLC Editor software. Make sure PLC and PC communicate properly before uploading .

As figure below :



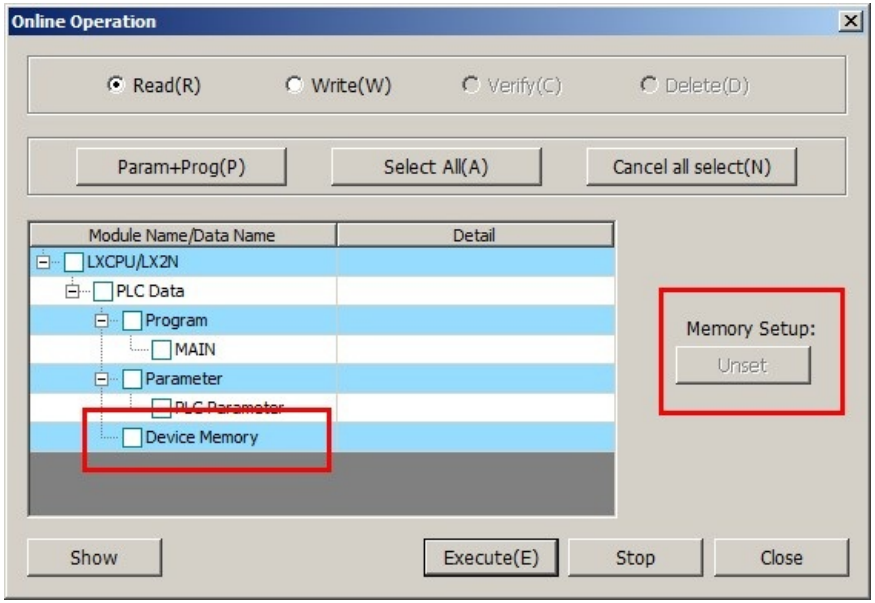
Button Description

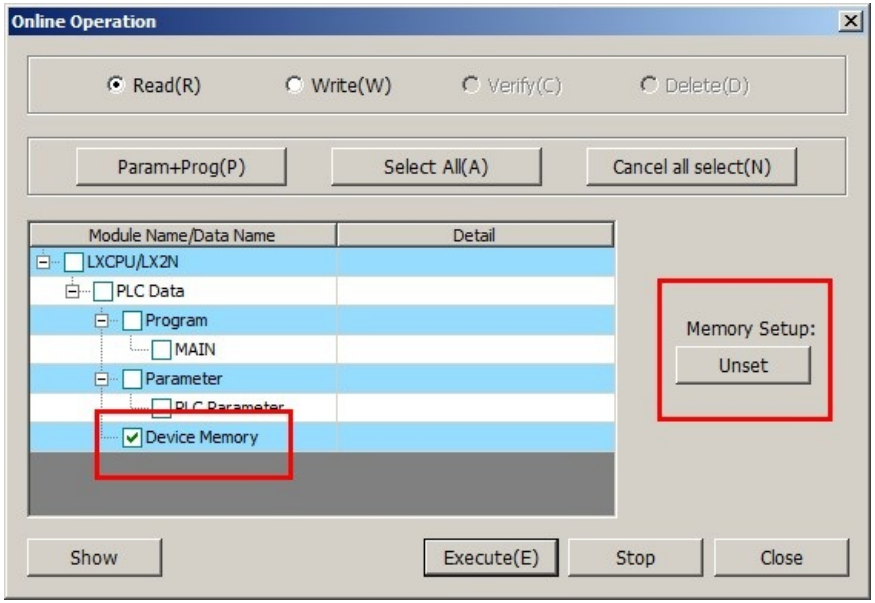
- [Param+Prog] : Upload parameter and Ladder to the PLC .
- [Select All] : Upload parameter ladder , comment , device memory zone set to the PLC .
- [Cancle Select All] : Deselect all
- [Excute] : Start uploading operation
- [Stop] : Terminate the upload operation
- [Close] : Exit the current window
- [Show] : Shows upload progress and other information , as figure below:



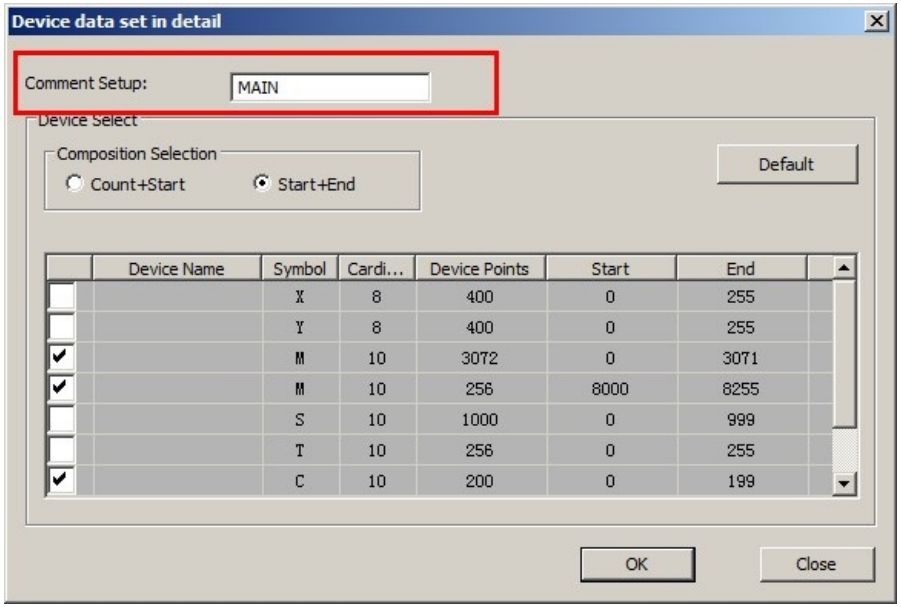
Memory Setup Description

Under normal circumstances, [Memory Setting] button is inactive, After select the [Device Memory] the button becomes active .





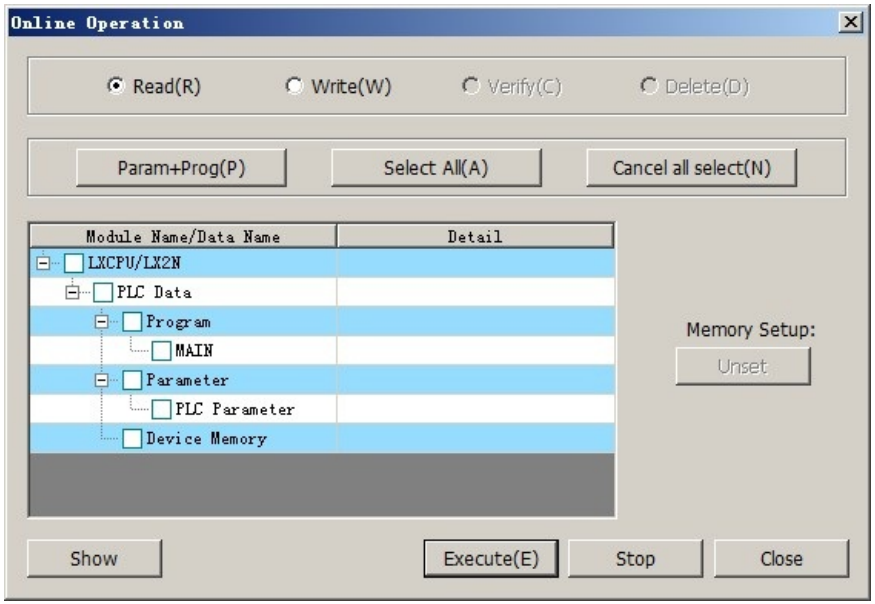
According to their need users modify detailed settings for the device, the device data name default is "Main" and "Null" .



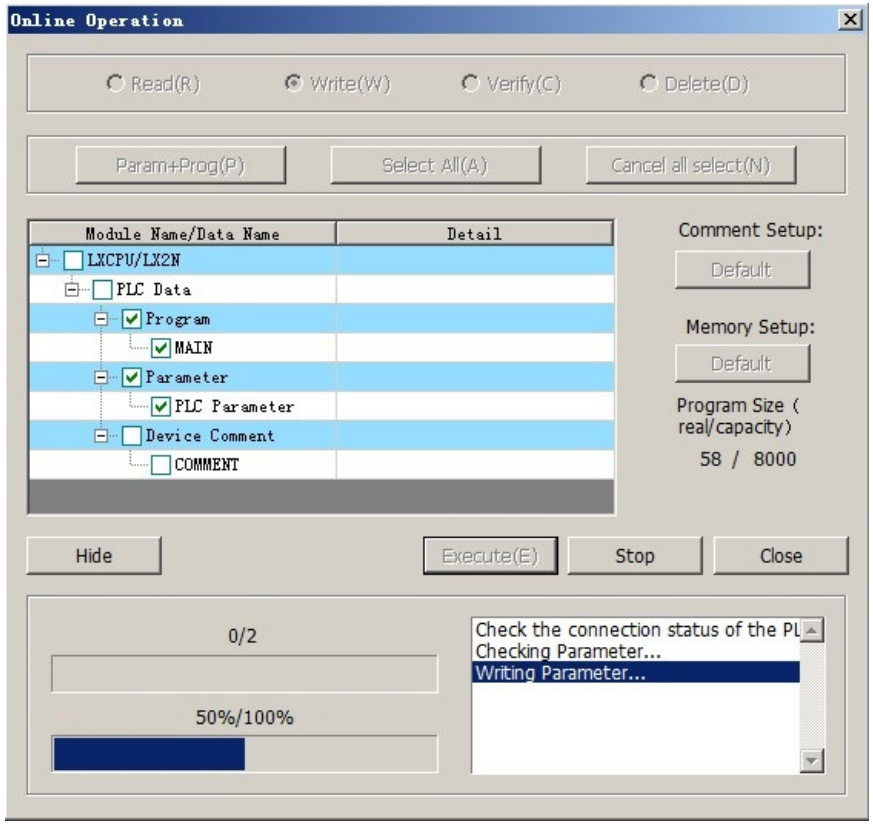
PLC Download

PLC Download于PLC Editor software is through the communication line transmit data to the LX series PLC . Make sure PLC and PC communicate properly before downloading .

As figure below :

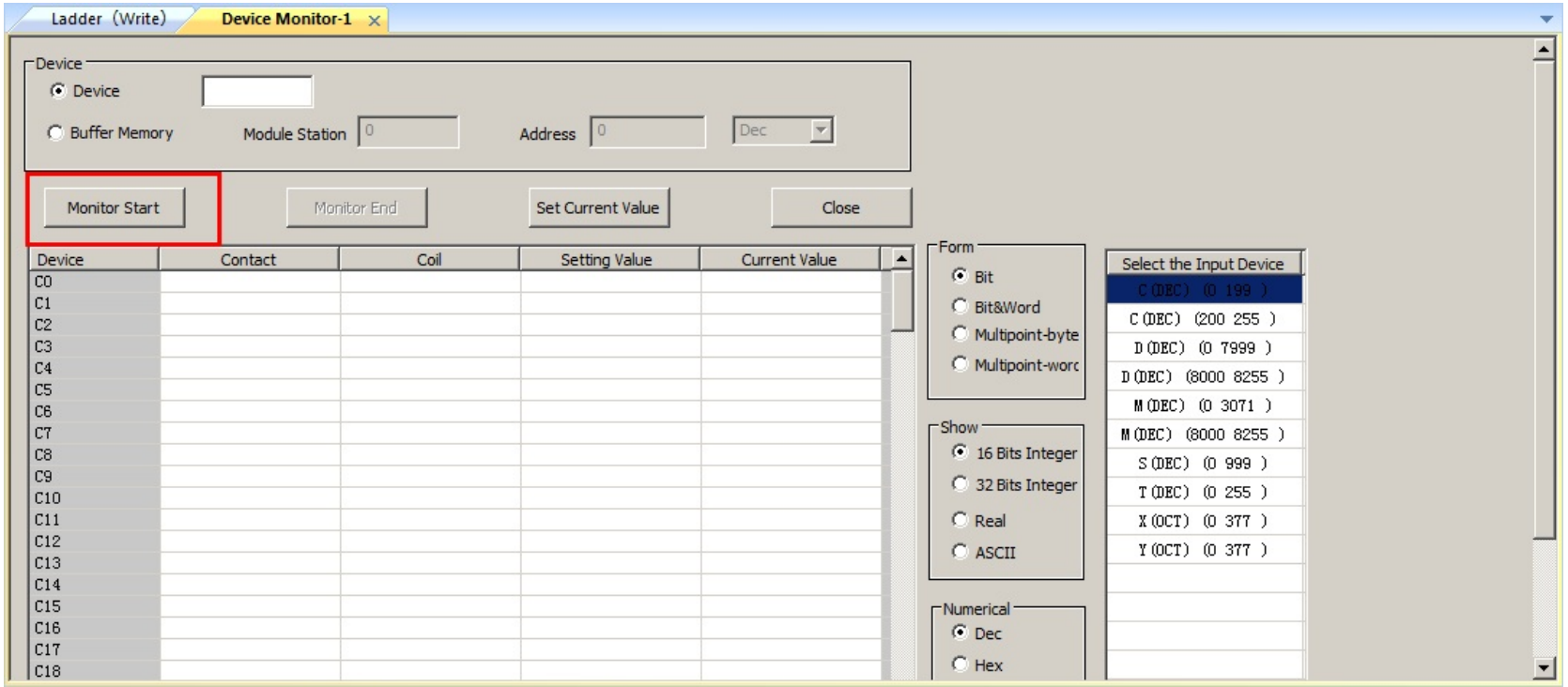


Progress of the download, as figure below :

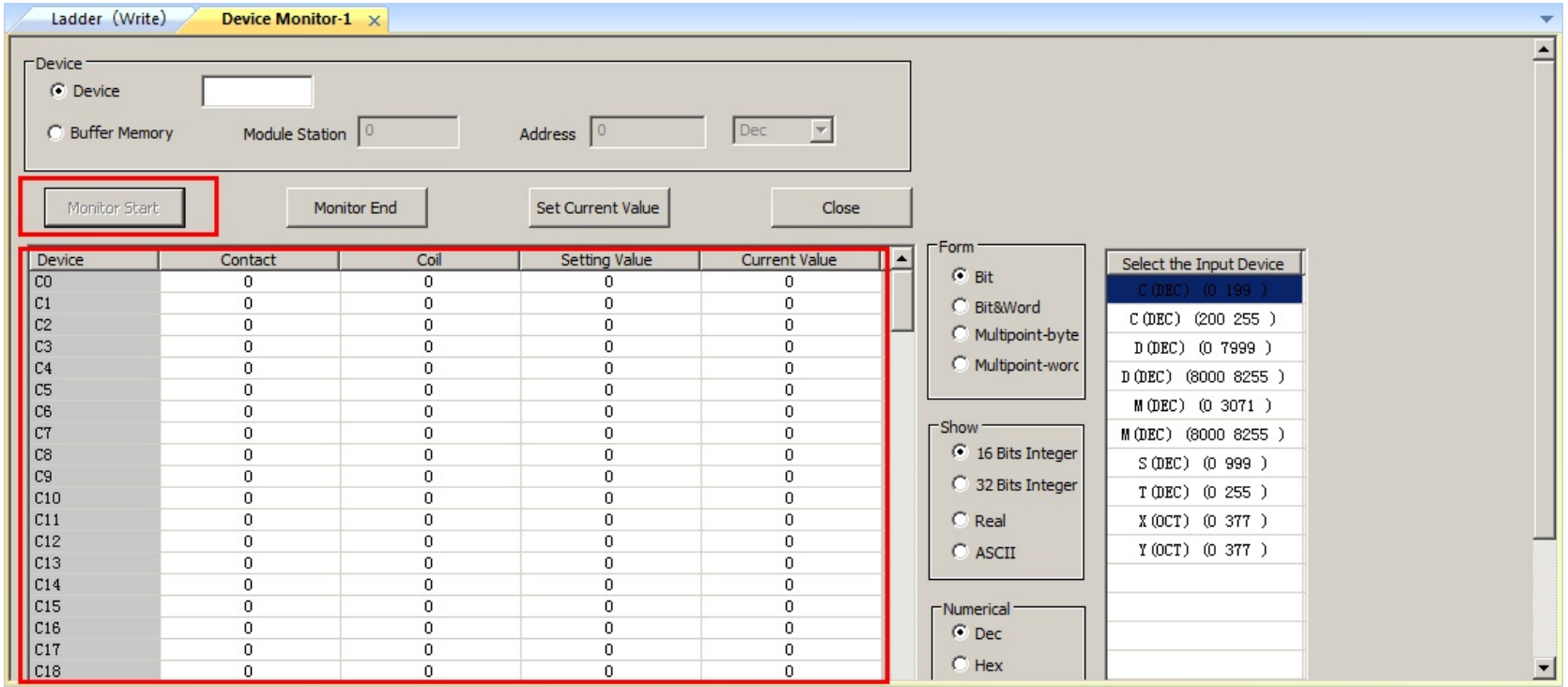


Device Monitor

Device Monitor : Available online to view, modify PLC register values and extension module value . Click on the button to pop up window(monitor not start) :



Click [Monitor Start] button to begin monitoring , as the below :



Button Description

[Monitor End] : After end of the current monitor that we can not view or modify registers .

[Current Value] : Open the [Modify Device Value] window by clicking on the "Current Value" that you can modify value .

[Close] : Close [Device Monitor] window .

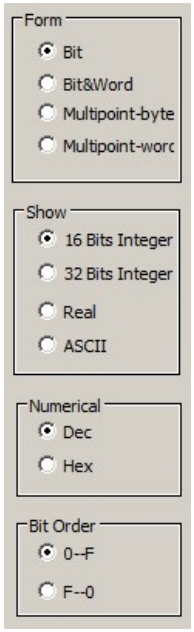
Device Description

[Device Name] : Input first device , Then you can view / modify the device by right "Device List" .

[Buffer Memory] : Input a special module (such as A/D, D/A module) block number to View / Modify .

[Address] : Input a special module (such as A/D, D/A module) address to View / Modify , It can be hexadecimal or Decimal .

Monitor display format as the below :



Note : Please ensure that normal link between PC and PLC before execute the project , otherwise it can't connect .

PLC Password Set

In the PLC-Editon , you can set a password for the PLC to maintain security. The password can be set to the "Upload Password", "download password", "clock password"

Explain : The three types of passwords are separate (when performing operations must use separately decryption), the password can be the same or different. It ensures the security and independence of the PLC.

as illustrated below :

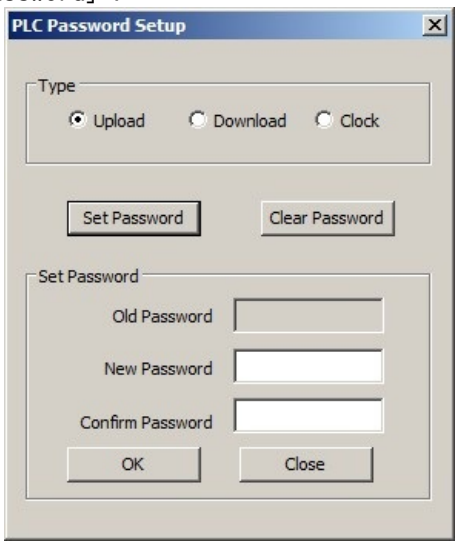
Set Password

Note :

- "Upload Password "," download password "," clock password " that three kinds of password setup steps are identical (only requires the user to select the type defined)
- The length of the password is 8 characters . It must be 8 characters .
- When you creat a new password that the first and second confirmation password must be same .
- When you excute the cryptographic operations, please ensure that connect the PLC and the PC is in the normal state, while the PLC must be NOT RUN state (closed PLC panel switches) .
- If you input the five-time password error that the password will be locked, If you want to input the password again restart PLC .

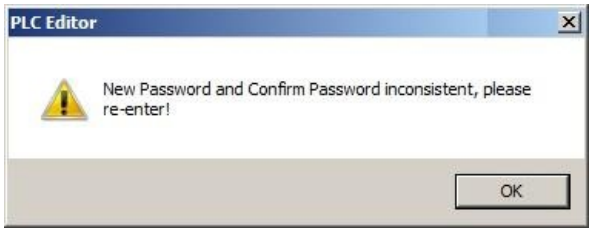
Begin Set Password

1. Connect PLC and PC while runing the compiler .
2. Close the PLC RUN status .
3. Click on the button of [PLC Password Setup] in the [online] screen .
4. Open a new window, if it can't input in the [Old Password] input box . This indicates that PLC is currently not encrypted PLC.
5. Select the type of password then click the [Set Password] .



6. Please input a correct password according to the instructions.
7. Password length is not enough .

8. Inconsistent secondary password .



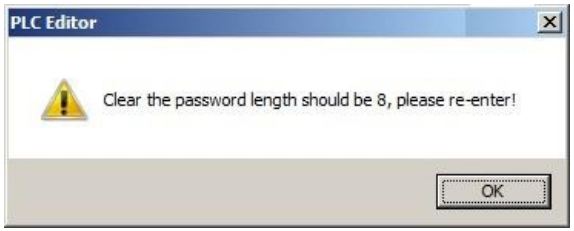
9. Password is set successfully.

Clear Password

If the PLC has no password that you can ignore this note . If PLC has set a password, you need to clear your password that you must input the existing password . Input errors over five times refer to Note .

Clear password step :

1. Connect PLC and PC while runing the compiler .
2. Close the PLC RUN status .
3. Click on the button of [PLC Password Setup] in the [online] screen .
4. Select the type of password then click [Clear Passwords] .
5. After opening a new window, enter the password in the [Enter Password] area then click [OK] to clear passworrd .
6. If you enter the wrong password that prompt will be as shown below:

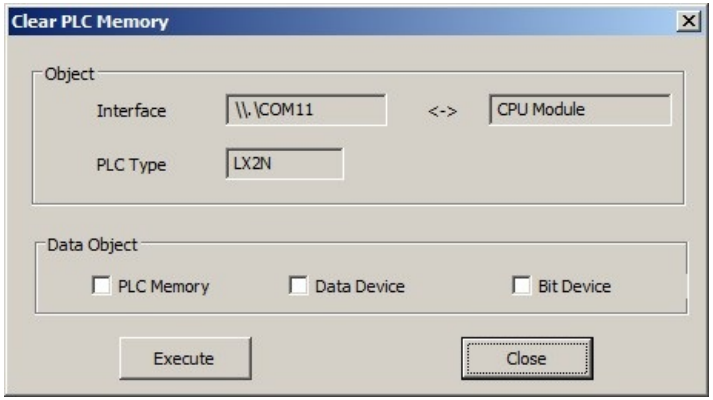


7. If the password is correct , as shown below :

Clear PLC Memory

Clear PLC Memory is to clear the PLC internal data so that initialize the PLC .

Click [Clear PLC memory] , As shown below :



Module Description

Object : Displays the current link PLC information and parameters . It usually can not be changed .

Data Object : You can multi-select the object what you want to clear .

1. PLC Menmory : Clear PLC memory that is initializing the PLC
2. Data Device : Clear all the data blocks settings (device memory area of the D register default value)
3. Bit Device : Clear all data blocks setting (Device Memory) of the bit device values.

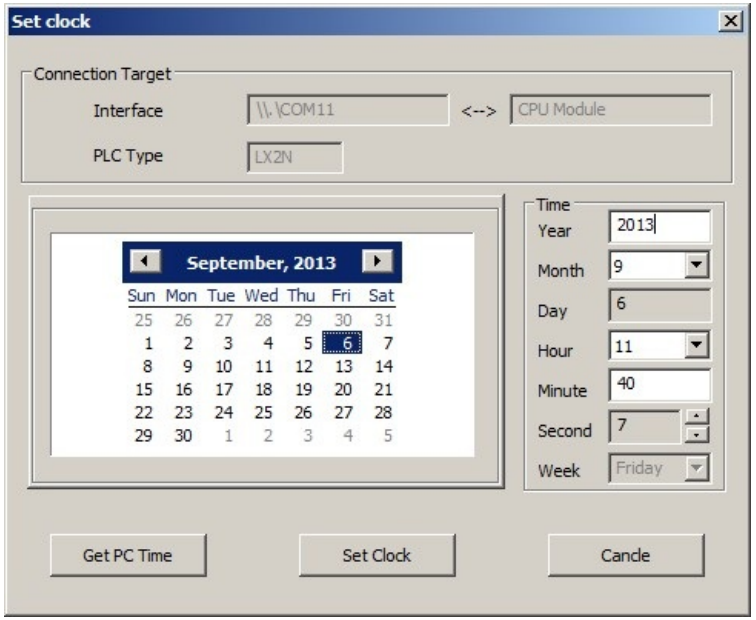
Note: When you perform cleaning operations, PLC must be in NOT RUN.

Data is priceless, careful operation

PLC Clock Set

Set PLC clock, you can customize the internal PLC time to achieve accurate calculation

You can open the PLC clock set window by clicking [PLC Clock Set],



Module Description

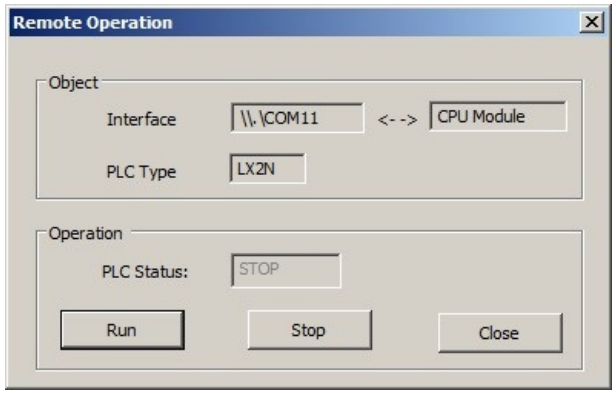
1. Connection Target : Displays the current link PLC information and parameters . It usually can not be changed .
2. Time and Calendar : You can easily select the time information and free to match time.
3. Get Pc Time : Let the software automatically reads the current PC time without manual calibration .
4. Set Clock : After completing the settings, click the button, then PLC will save the current settings .
5. Cancle : Don't save the current operating data . Exit and close the window .

Time

1. Please ensure that the PLC and PC is normal communication .
2. Open the [Set Clock] window by click [PLC Clock Set] .
3. Select a user need time in the calendar panel or time control panel .
4. Year range of 1980~2079 ; Month range of 1~12 ; Hour range of 0~23 ; Minute range of 0~59 ; second range of 0~59 .
5. You also can get current time by click [Get PC Time](provided that the PC time is accurate) .
6. After configuration, please click [Save] to set the clock .
7. Clock set success as shown below :

Remote Operation

Remote operation can quickly change the status of the PLC and control the PLC switch .



Module Description

1. Object : Displays the current computer port, PLC connection status and other information .
2. Operation : Displays the current status of the PLC, RUN or STOP .
3. [RUN] : PLC into RUN state .
4. [STOP] : PLC into the STOP state .
5. [CLOSE] : Close the window .

Note : Please ensure that the PLC and PC is normal communication .

PLC Diagnostics

This function concentrate most of the functionality on the online menu, Do not describe in detail, In this panel the user can view the PLC's diagnostic data, and can quickly carry out various operations .

Tool

After the program finished, check the program to ensure the program correct in logic. If no error, offline simulator to test the operation of downloading the program into the device.

Tool menu provides two functions : Check the program and offline simulator, as the below figure:

Check program : Check the command/soft component, logic, double coil after finish compiling the ladder diagram(command).

Simulate : Simulate the program running in the device after compiling the program.

Check Pragram

Program testing is done in written form in the program, checking the program can be timely corrected as well as location the wrong. At the same time can quickly locate to the wrong place.

Use : As shown in the figure below, first write after completing a program, click on the "program check", check window will pop up the program.

1. Inspection range:

   ／Current program: The program in current page;

   √All program:All the program in the project.

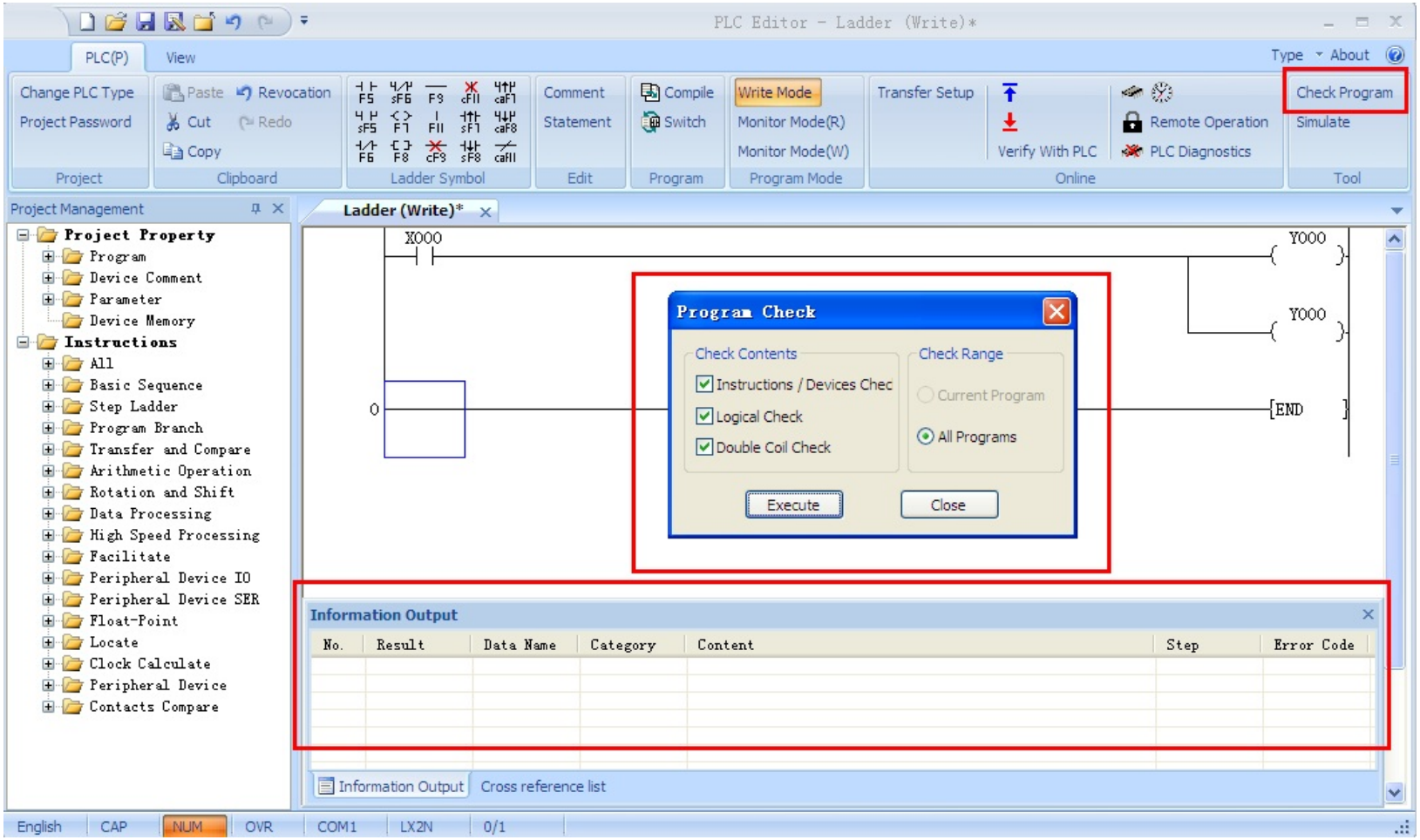
2. Inspection details:

   ／Command/soft component inspection: Inspect the grammar of the command and the range of the soft component;

   √Logic inspection: Inspect the grammar and the logic of the program;

   ∝Double-coil inspection: Inspect wether use the same coil output many times.

At this time only need to select the user want to perform inspection items, click on the "execution".as the below figure:



If there is no error in the program, the system will pop up "program right". If the program is wrong, then the "output" modules will be listed at the bottom of the figure the wrong place, select the specified the wrong project, double-click can locate to the ladder diagram the wrong position.

Simulate

Through [simulate] function, you can be very convenient to testing simulations .

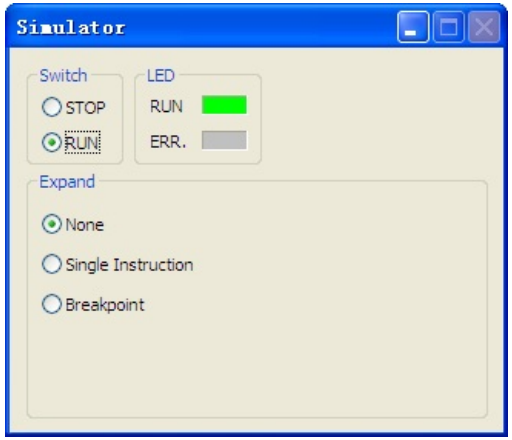
preparation :

1. Enables the compiler to run
2. Create a new project, and then compile

Start online simulation:

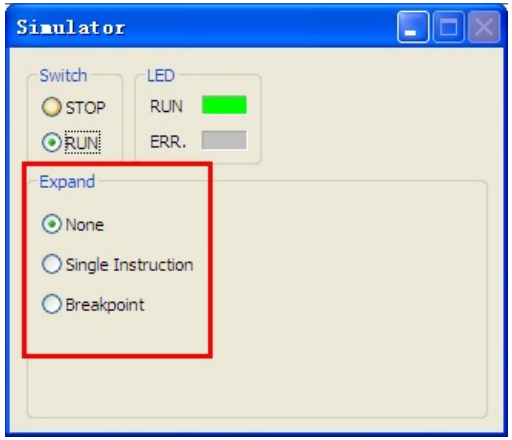
1. Move the mouse pointer to the [tool] module, left-click [simulate] ; As illustrated below :

2. After step 1, program will pop up a new dialog box



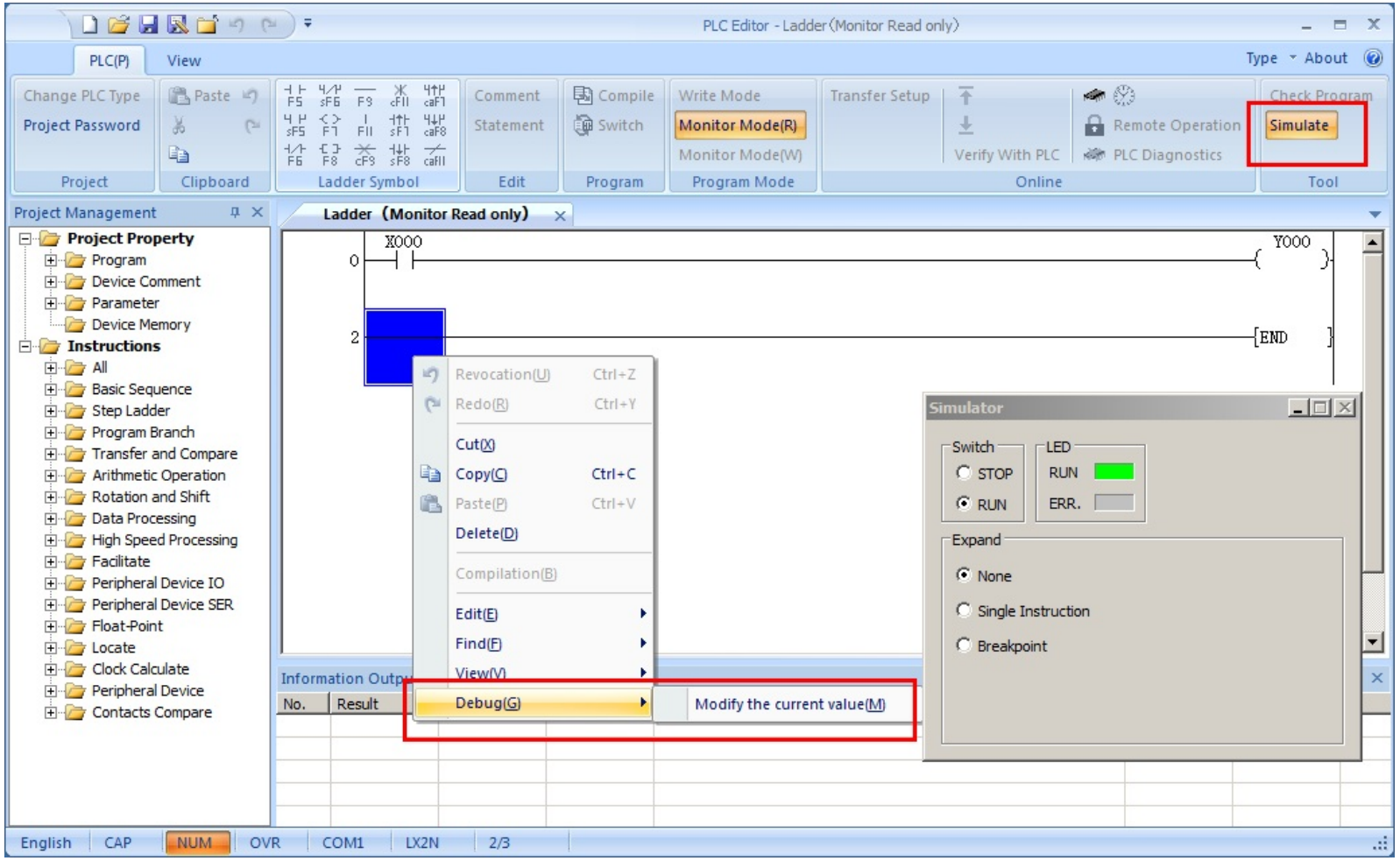
Debugging ways:

1. Single-step debug: Execute the program step by step. interrupt after the program executes a sentence or a process.
2. Breakpoint debugging: Set the breakpoint in some row, the program will stop in this row when execute.

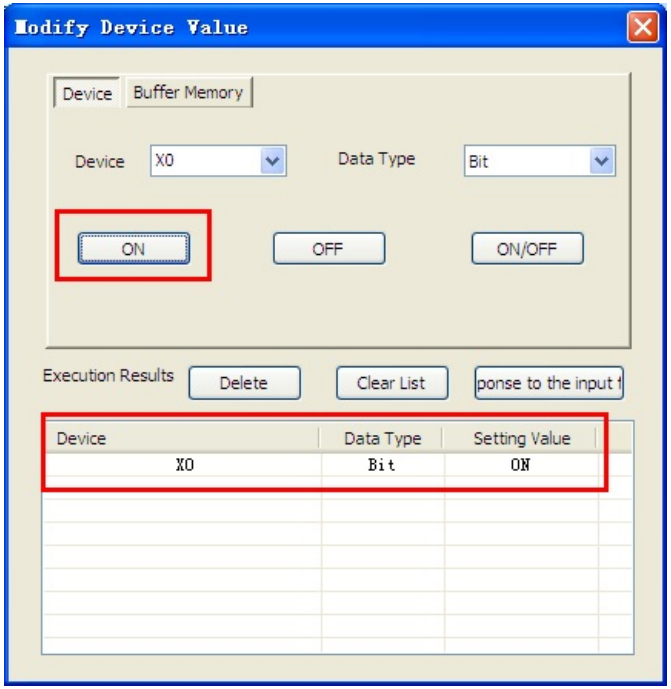


3. That do not operate for the new dialog box .

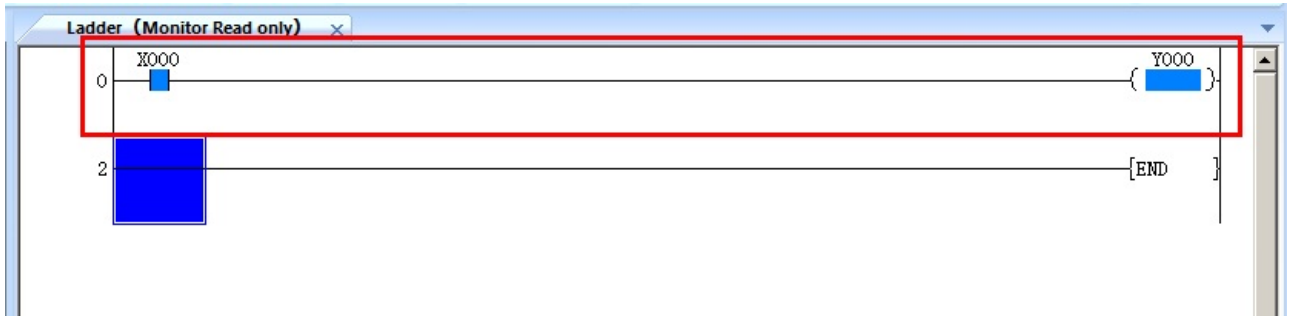
4. Move the mouse pointer to the desired position to operate the emulated instruction, right-click the specified location, select [Debug] - [Modify current value]. As illustrated below :



5. After completing step 4, it will pop up a new dialog box that is [modify the device value] , At this time, put the device [ON], the specific operation as illustrated below :



6. After completing step 5, there will be as illustrated below :



Program editor area

In program editor area.The user can freely switch ladder diagram and instruction list to edit and maintain program.

Insert or delete line

Insert a new line

1. Select the rows you want to insert.
2. [Shift] +[insert] can insert, or move the mouse to any position of the specified row . Click the right mouse button and select the [edit] and click [insert program].

Statement for insert of a line

1. Select the rows you want to insert.
2. Method one : [Shift] + [Ctrl] + [insert]
3. Method two : [Ctrl] + [F7]
4. Method three : Click the right mouse button and select the "edit" and Click on the [insert statement line]

delete line of program

1. Move the mouse to the rows that need to delete.Hold down the left mouse button and move the rows that need to be deleted (Can be multiple lines). Selected area to change color .Click on the keyboard [DELETE]
2. Move the mouse to the rows that need to delete.Hold down the left mouse button and move the rows that need to be deleted (Can be multiple lines). Selected area to change color .Click the right mouse button in the area of color changed, then enter [Delete or edit] and select [Delete Row]. Statement for line delete.
3. Move the mouse to the rows that need to delete.Holding down the left mouse button and move the rows that need to be deleted (Can be multiple lines).Selected area to change color .Click the right mouse button in the area of color changed, then enter [Delete or edit] and select [Delete Row] .

Copy and paste function

When ladder diagram needs a large number of the same device, use copy and paste function to save time quickly.

The step

1. The mouse moves to the editor area of ladder diagram.
2. Select the specified cell or draging the mouse to select a region.
3. Use [copy] button of [Clipboard] in "PLC" menu, or use keyboard [Ctrl] + [C] , or use the right mouse button [copy] function.
4. After completing the third operation,make the designated area copy to clipboard .
5. Move the mouse to specify the location where it needs.
6. Click [paste] button on the clipboard.or using keyboard [Ctrl] + [V] : you also use [paste] function that the right button of mouse, to cope Specifies the data to the specified .

Note

- Only when a component of occupied the cell is in the left within the selected area ,the components will be copied.
- When there is a vertical bar in copying area,Only when the vertical across the top and bottom cells is within the range of choice.The vertical bar will be copied to the clipboard.
- No matter to use which edit mode,When you perform paste function,only to use the overlay mode.Make the component clear within the range of pasting.Then paste every compoent of the clipboard one by one.

Modify the ladder diagram component

Modify the ladder diagram component

The step of modifying the ladder diagram component

1. You must ensure that it can modify the ladder diagram component in [Write Mode] of current state.
2. Use the mouse to select components that need to be modified.Double click the left button of mouse or click the [Enter] key on the keyboard
3. After completing the second step,there will popup dialog of output instruction.
4. Put the corresponding instruction of the selected component input the dialog.
5. Click on [sure] to save the changes

noteチ

- Instruction of revision must be able to verify by the proper instruction, it can be saved.
- Contact component Of occuping a cell(normally open, normal close, rising edge, failling edge, inversion, Stepping)should not be modified with the compared contact each other.
- All of the contact component can't modify each other with coil or application instructions.

Delete the ladder diagram component

The steps of deleting the ladder diagram component

1. You must ensure at [write mode] of current status that you can delete the ladder diagram component.
2. Using mouse to pitch on the element grid that want to delete.clicking the left button of mouse. Selecting the part is lock-in by blue frame.Then you can click keyboard [DELETE] to delete.
3. Delete the horizontal and vertical linesチin this special ladder diagram,you can do the method that step 2 or 3 to Select the target.Then Click the icon [CF9] or [CF11] to delete in the [Ladder diagram symbols] function of menu.

Enter the instruction of ladder diagram

Entering the instruction of ladder diagram's method have 5 kinds.

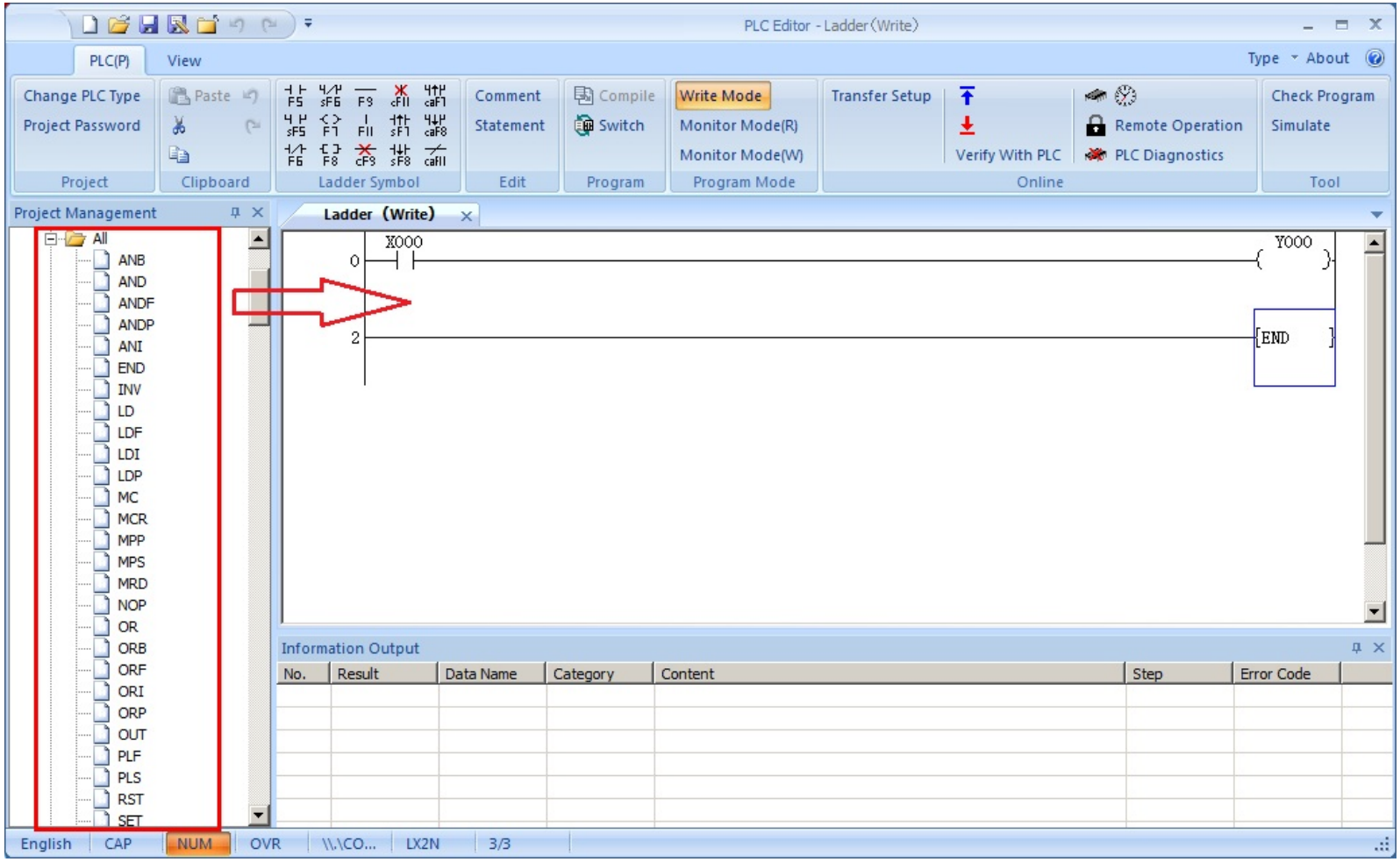
The method of direct input The method of instruction set input The method of double-click cell The method of instruction help The symbol of ladder diagram/A shortcut method

The method of direct input

1. Move the mouse, left-click on the specified cell.
2. Directly input the specified command. The system will automatically pop up input box of ladder diagram.
3. Enter the complete instructions and parameters in the dialog.
4. Click on [OK] or [Enter] button in the keyboard
5. System will verify the correctness of input, If it check, there is generating graphic symbols of the instruction.
6. If prompt is incorrect or can not be saved, please return to find the cause of the error.

The method of instrcution input

1. Move the mouse to the form on the left of [the Project Management] interface
2. Expand [Instruction Set]
3. Open the command tree of users need
4. Pitch on instruction that is user need. The left button of mouse clicks to select. Draged into [Ladder diagram into area] and placed in the designated area.
5. After finishing step 4, it will popup [Ladder diagram input]
6. Put the right operand in the input box.
7. click on ; [Save] or keyboard [Enter]

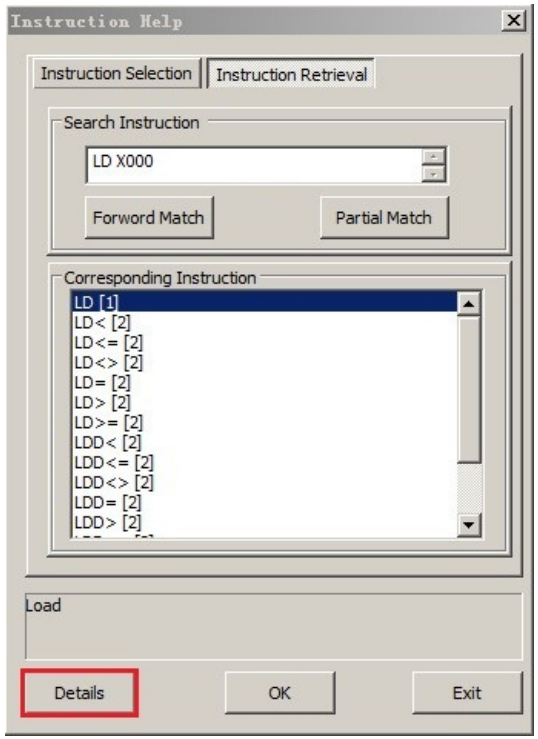


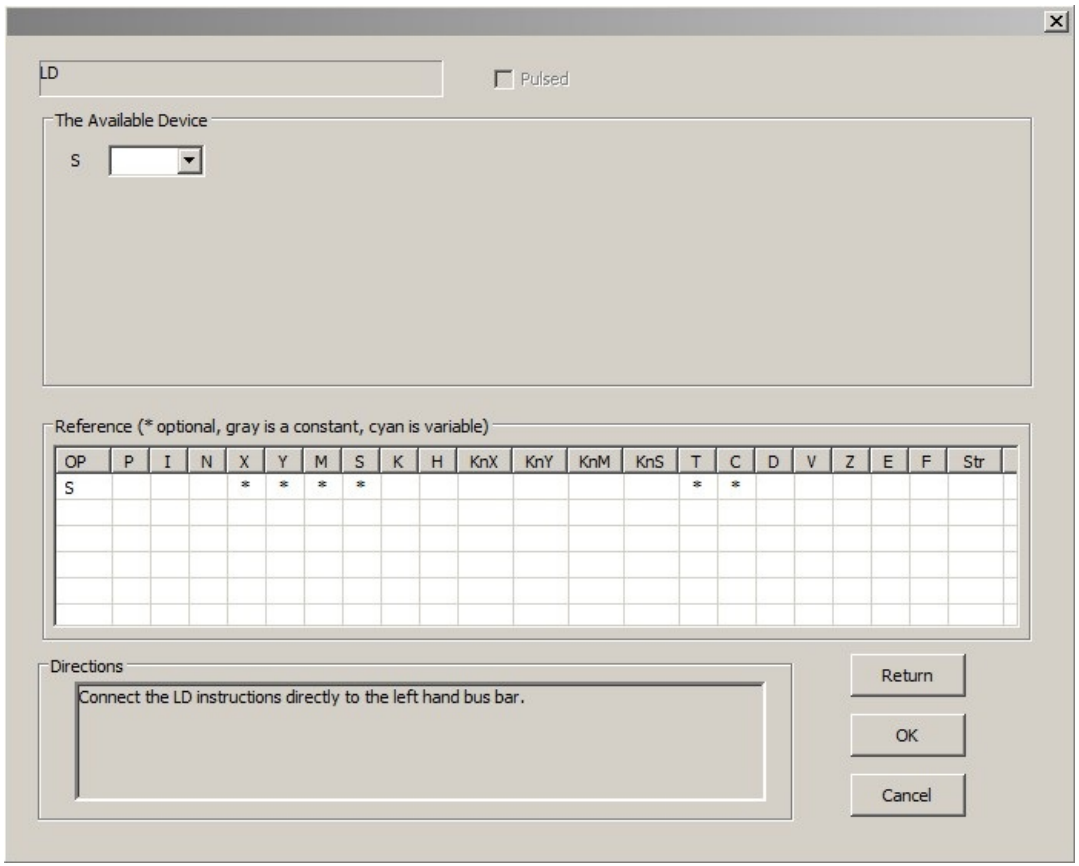
The method of double-click the cell

1. The mouse moves to the designated area⊐double-click the left button of mouse.
2. Popup [Ladder diagram input] , input the correct order in the input box.
3. click [Save] or keyboard [Enter].
4. If the prompt is wrong or can't save.please come back ladder diagram to find the error.

Method of instruction to help

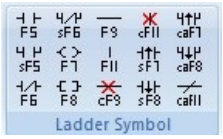
1. The mouse moves to the designated area, double left click .
2. popup [ladder diagram input]
3. click [help], popup [Instruction help]
4. After select the instructions that need to input, Click [Details] button, popup [Instruction Wizard]
5. Wizard interface chooses the right operand according to different instructions.
6. After choosing the specified instruction, click [Ok] to save data and complete the instruction input




LD
Pulsed
The Available Device
S
Reference (* optional, gray is a constant, cyan is variable)
OP P I N X Y M S K H KnX KnY KnM KnS T C D V Z E F Str
S * * * * * *
Directions
Connect the LD instructions directly to the left hand bus bar.
Return
OK
Cancel

Ladder diagram symbols/A shortcut method

Ladder diagram symbols located in the PLC menu, as the below :



After selecting cell, then click the menu. "Ladder diagram symbols" You enter operands on the ladder diagram to complete the command input. If the instruction is the application instruction. After click the faceplate "F8", You should enter the complete application instructions and operand in the ladder diagram input box that finish the instruction. You also use corresponding shortcut of instruction. (See the instruction_list) input, operation method and "Ladder diagram symbols is the same."

After completion of the instruction input and click ladder diagram input box "sure " button. It will display in the ladder diagram editor area.

Note:

1. Some instructions only input in the editor of order listクILグ. You can not input in the ladder diagram, such sa MPS┴MPP. When you directly input in the ladder diagram of these instructions. It can not generate any component.

2. Because coil and application instructions representative the line is over in the Ladder Logic Program. You can not enter any component behind these components.

3. Due to the vertical bar can take up two rows of space. At the time of inputting a vertical bar, if the location of next line just is center section of other component, then the vertical bar can not enter.

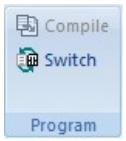
4. The maximum number of columns is 13 line.

compile program

Compiler refers to after completing programming or after completing the design of the ladder, to generate a program that must be compiled

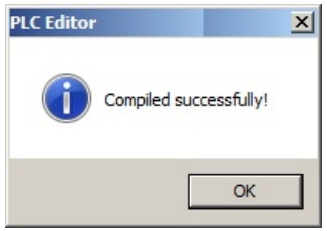
As the below，If the program is not compiled, [program compilation] Button is highlighted and you can use it.

If program compilation is completed, [program compilation] Button is not to be used.

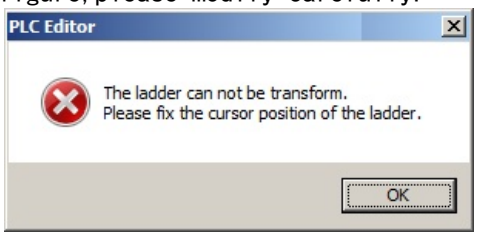


The procedure for compiled

1. Open this software，then create a new project.
2. Compile the programs in the ladder diagram program.
3. After completing the design,click on the [compiled regional] Button of the program to compile.
4. As shows in the figure below indicates success.

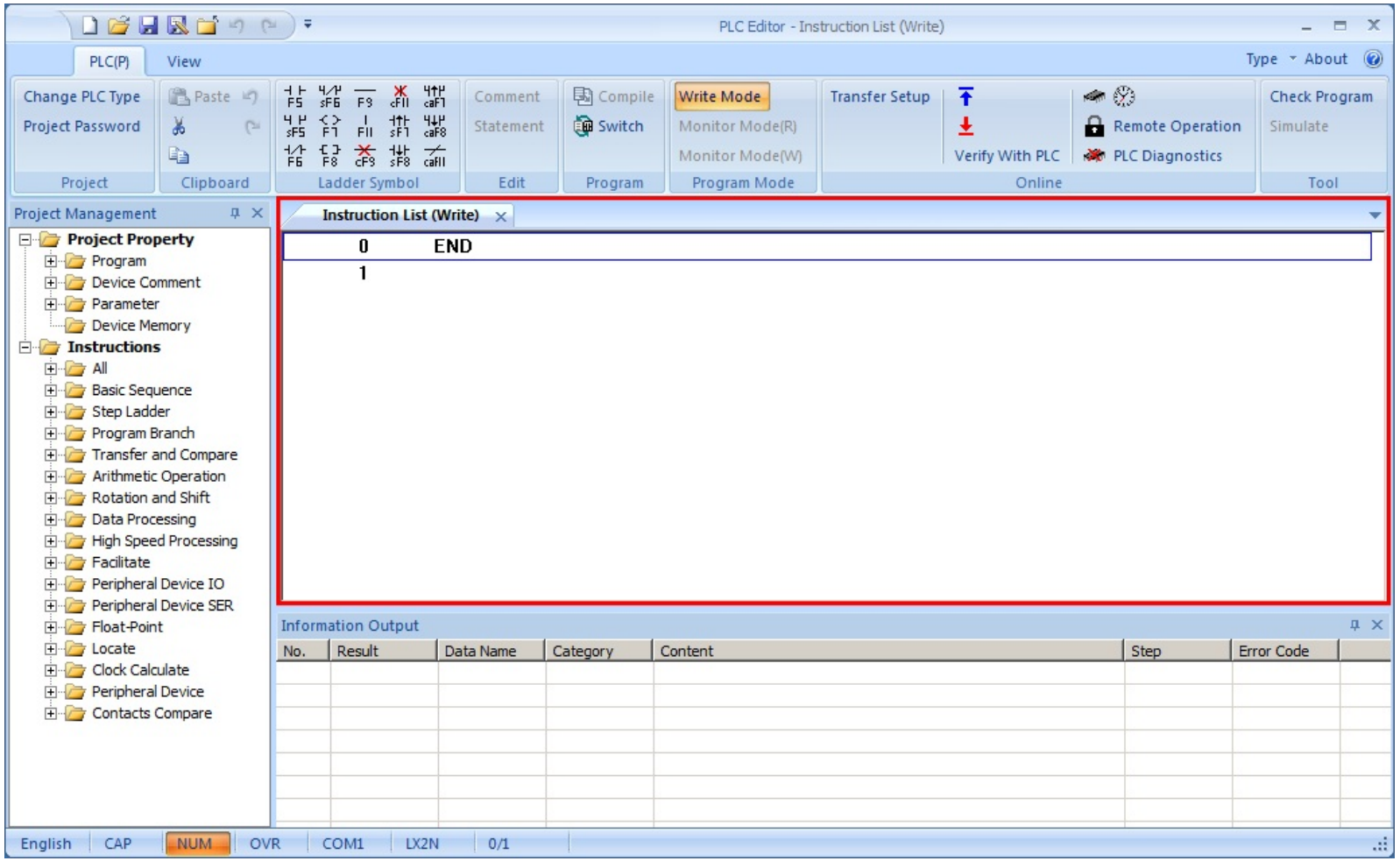


5. If there is a mistakes in the program as following figure,please modify carefully.



Instruction table editor

The software not only provides the ladder diagram editor, but also provides the instruction table editor. Instruction list is used for enter of instruction and operand. The way of inputing instruction is the same as ladder diagram. After input the instruction, system will calculate the steps of instruction, and automatically align instruction, operands. As the below :



Instruction input

The steps of instruction input

1. The first is to create a new project.
2. In the menu bar [program compilation] area, clicking [Program switch] will switch instruction table editor from the ladder diagram editor.
3. If there is uncompiled program in the ladder diagram editor,[Edit Comment] please.
4. The mouse moves to shadow of instruction table. Open it by double-left click.
5. You can input the specified command in the new window.then click [save]

Copy, cut and paste of instruction

< p>

1. Creat a new project and switch to the command table interface.
2. Select the area or element that need to be copied,cutted. Click [Ctrl+C] or [Ctrl+X] to copy,cut on the keyboard.
3. After finish step 2, move the mouse where wanted then [Ctrl+V].

Find and replace function

The same as most of OA software,Standard search/replace functions are provided in sequential function chart.

1. The first is to create a new project.
2. Open the interface of find and replace and enter what you want.
3. About the function's description of finding and replacing window, please shift "————————————"

other description

Step No. : Step No.refer to location of instruction.It can be use quickly positioning of instruction and improving the readability of the instruction.ladder diagram-instruction list switch:If program logic is wrong,it can not switch.

The function description of right-click for program editor area

In the program editor area, clicking the right key of mouse. It will popup commonly used functions button. It can greatly improve the development efficiency of developers.

- Revocation : Cancel the current operation and roll back the previous step.
- Redo : Rollback undo operation
- Cut : Cut the selected ladder diagram in the ladder diagram.Cut the selected command line in the list of instruction.The content is store in the clipboard.
- Copy : Copy the selected ladder diagram in the ladder diagram.copy the selected command line in the list of instruction.The content is store in the clipboard.
- paste : At the selected location, Paste the data in the clipboard.When no data in the clipboard, Paste is not available.
- Compile : Compile the current program.

Edit Options

- Insert program line:In the currently line insert a empty line in the ladder diagram or instruction list.
- Line statement line:In the currently line insert a blank statement in the ladder diagram or instruction list.
- Delete row: Delete the currently rows in the ladder diagram or instruction list.
- Insert column In the ladder diagram (It is not available in the instruction list), add a blank instruction at the place of selected instruction.Other instructions move right in one grid.
- Delete column In the ladder diagram (It is not available in the instruction list), Delete the currently selected command Other instructions move left in one grid.

Search

- Find Device : Open the search/replace window.The default search page of device.If the selected instructions contains soft component in the ladder diagram or instruction list."Search the device". The default for the soft component of selected instruction.If it is nothing,let it empty.
- Find Instruction : Open the search/replace window.The default search page of instruction.If in the ladder diagram select instruction"Search instructions". The default for selected instruction.If it is nothing,empty it.
- Find character string : Open the search/replace window.The default search page of instruction.If in the ladder diagram select character string"search character string ". The default for character selected string.If it is nothing, empty it.

View

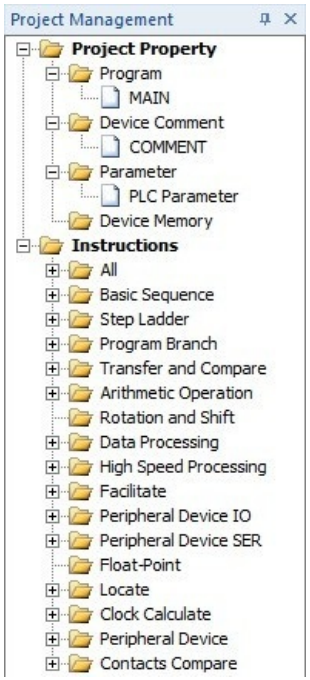
- Show Comment : In the ladder diagram (Instruction list is not available), show the soft component annotation.
- Show Alias : In the ladder diagram and instruction list,display the alias of device.

debugging

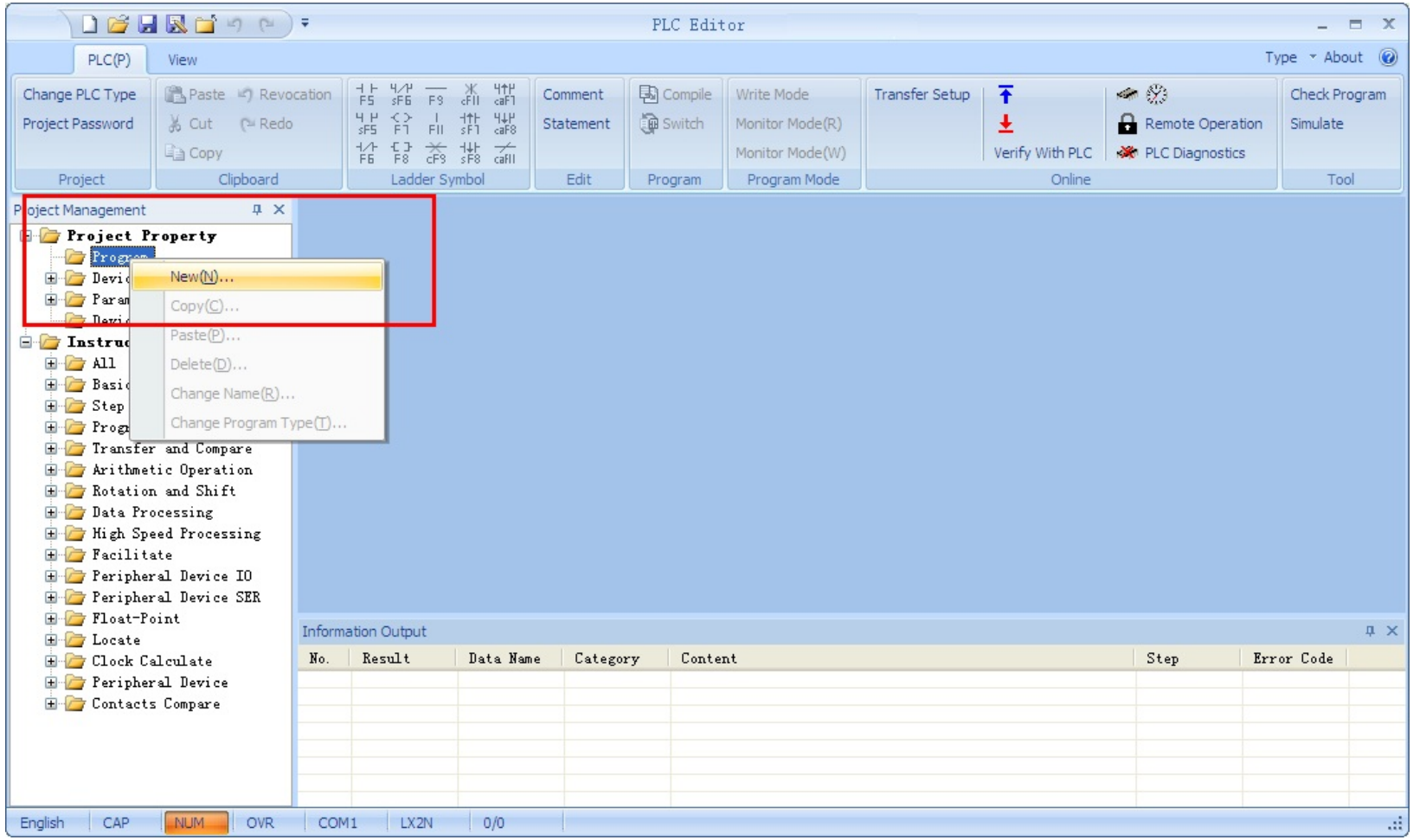
- Modify the current value : In monitoring mode (Write mode is not available), Open the written dialog box of device.Modify soft component values of the currently instruction.

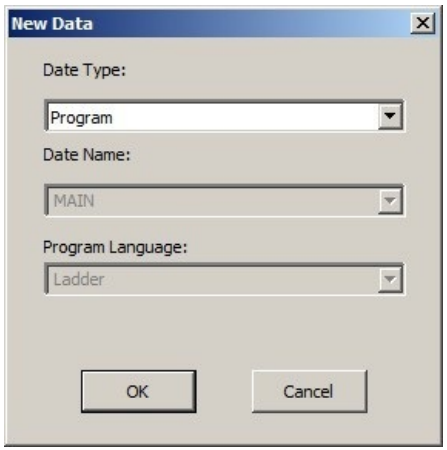
Program

MIAN for the program name, the project can only exist a program. Double clicking on the MAIN can open the ladder diagram in the users area, then the user can edit program.



When there is no program, select the program right click -> new window to open the new program, then the following figure:


PLC Editor
PLC(P)
View
Type
About
Change PLC Type
Project Password
Project
Paste
Revocation
Cut
Redo
Copy
Clipboard
Ladder Symbol
Comment
Statement
Edit
Compile
Switch
Program
Write Mode
Monitor Mode(R)
Monitor Mode(W)
Program Mode
Transfer Setup
Verify With PLC
Remote Operation
PLC Diagnostics
Online
Check Program
Simulate
Tool
Project Management
Project Property
New(N)...
Copy(C)...
Paste(P)...
Delete(D)...
Change Name(R)...
Change Program Type(T)...
All
Step
Transfer and Compare
Arithmetic Operation
Rotation and Shift
Data Processing
High Speed Processing
Facilitate
Peripheral Device IO
Peripheral Device SER
Float-Point
Locate
Clock Calculate
Peripheral Device
Contacts Compare
Information Output
No.
Result
Data Name
Category
Content
Step
Error Code
English
CAP
NUM
OVR
COM1
LX2N
0/0



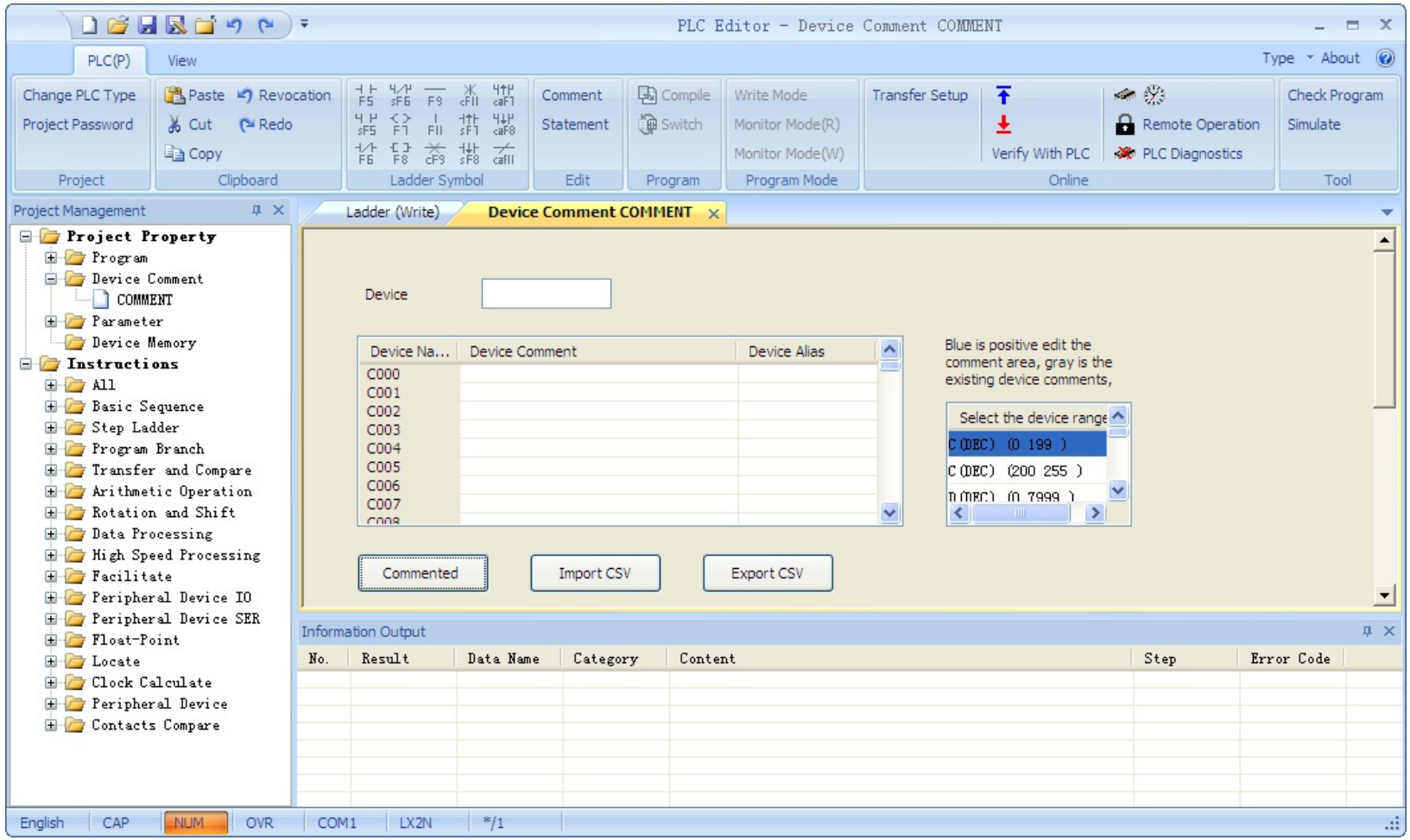
Program module : Right click on one of the program nodes under the program block, and select open program, delete program (the main program can be deleted) in the pop-up menu.

Note : A project is only one MAIN program.

Device Comment

Device comment moduleチA document ". wcp" and only one called COMMENT "Device comment" module; The device comment is defined and managed by the symbol table. The device comment could be directly modified in the ladder diagram device comment mode, and the modification in ladder diagram will be automatically updated to the symbol table.

Double click on the "COMMENT" in the following figure interface:

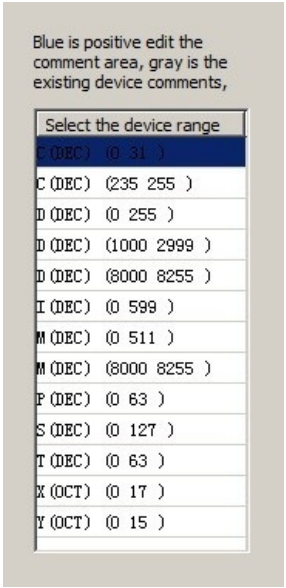


Interface label, instructions:

Device：Type in the name of the soft components correctly and press enter to determine, annotated list will locate the input soft components and selected (shown in blue).

Comments list into 3 columns：Device name,Device comment,Device alias.Device Name column shows for gray represents unavailable to edit, device comments column when device don't display it is white, on behalf of the editable. Click the comments list: Choose device line (shown in blue),double-click on the device comment or alias, pop-up edit box, for editing. The device comment values allow 16 characters, device alias allows only 8 characters.

Select the device range:Click comments can choose soft components interval, change list of soft component.Blue indicates that the device range is selected, black indicates the interval in the device comment or aliases, white indicates that the interval is not a device comment or aliases.The device range of 1s and 2n is different. The device range is as follows:


Blue is positive edit the comment area, gray is the existing device comments,
Select the device range
C (DEC) (0 31)
C (DEC) (235 255)
D (DEC) (0 255)
D (DEC) (1000 2999)
D (DEC) (8000 8255)
I (DEC) (0 599)
M (DEC) (0 511)
M (DEC) (8000 8255)
P (DEC) (0 63)
S (DEC) (0 127)
T (DEC) (0 63)
X (OCT) (0 17)
Y (OCT) (0 15)

Interface button, instructions:

Show the commented : Comments list displays all comments or alias device.

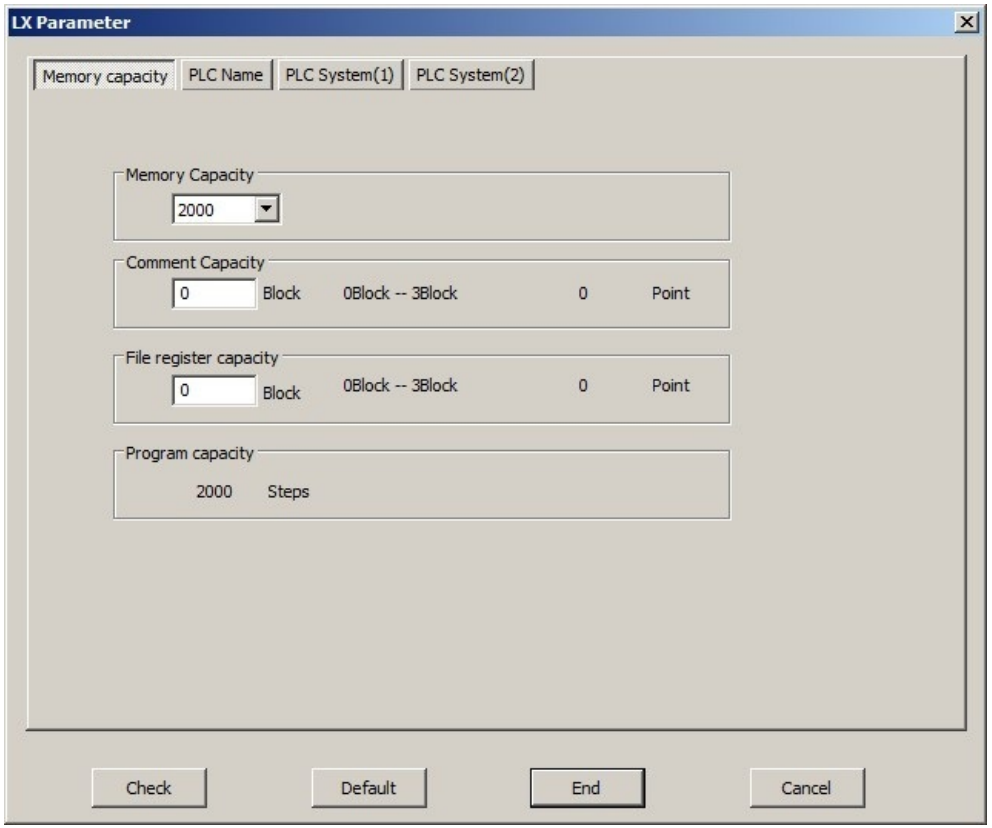
Import CSV : Choose the CSV file to import, all right the CSV file in device comment and alias imported into the software(Can only be the CSV file, LX2N comments into LX1S projects, if there are more than 1s scope of device comment complains).

Export CSV : Put all the editing device information of device comment or alias, export to the local disk to save the CSV file.

Parameter

Parameter : According to the need to set the PLC parameters; There is only one "PLC parameters" do not delete and right click on the new; Click on the upper right corner of the symbol "x" to close the dialog changes not saved;

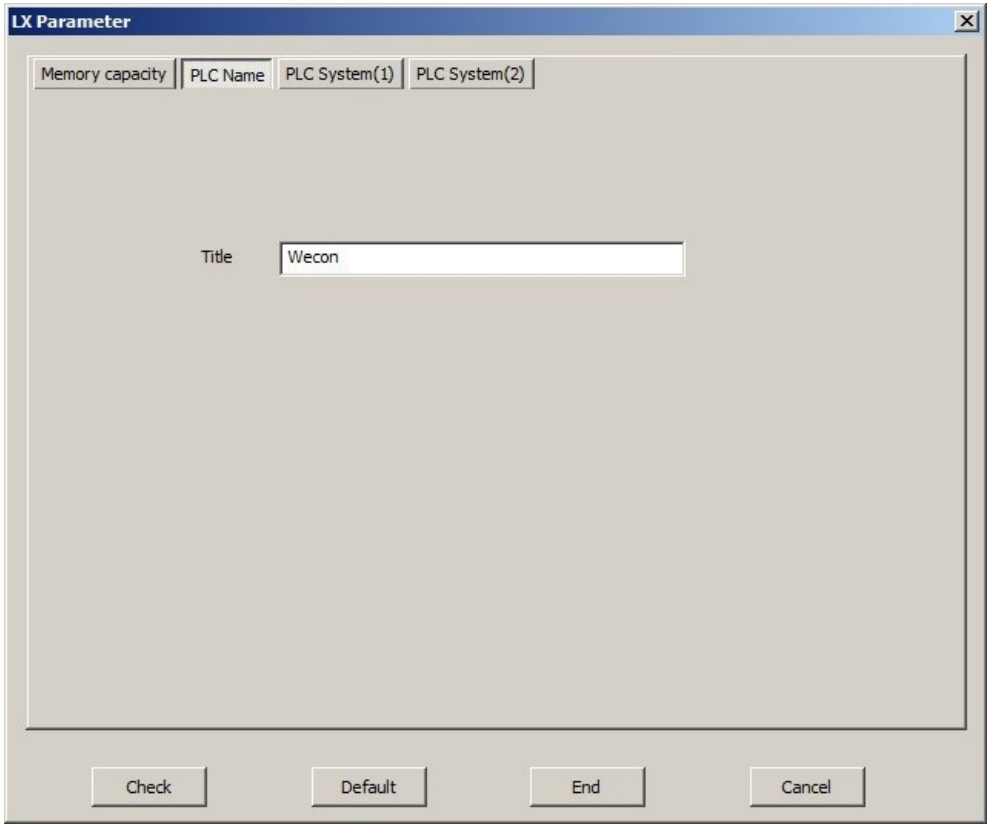
Double-click LX1S series engineering "PLC parameters" nodes the below (left) interface; Double-click LX2N series engineering "PLC parameters" nodes appear the picture on the right as show in the interface.



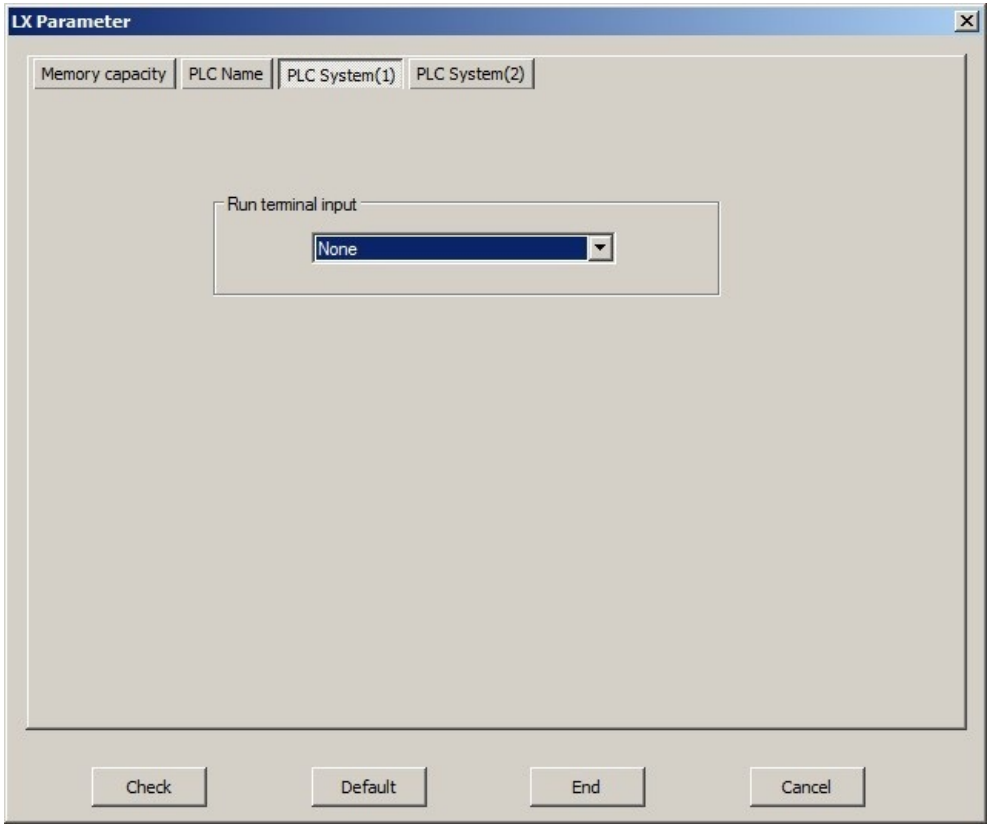
Interface label, instructions:

Memory capacity include:Memory capacity, comments, capacity, register file capacity, set the annotation capacity and capacity of register file which cannot be out of range, If it out of range that the modificy is not successl; Program capacity = memory capacity - comments capacity * 500 * 500 - register file capacity.Program capacity must be greater than zero, or wrong modify will be not success,

PLC name:Input PLC name, allow 32 bytes, one of the Chinese account 2 bytes, interface is as follows:



PLC System(1)チSelect terminal operation, interface is as follows:



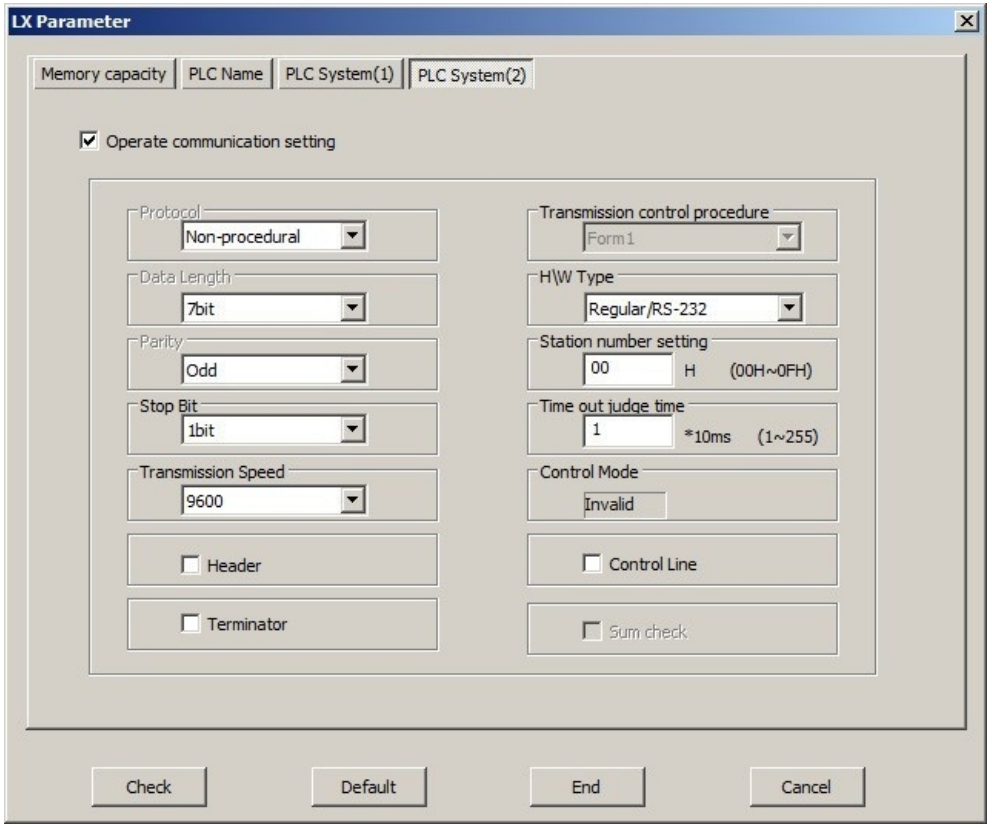
CheckチCheck the current settings, whether the "program capacity" is greater than zero. If "program capacity is less than or equal to zero, the examination will be successful by setting, and at this time click the ∠ button will be an error.If "program capacity is greater than zero, the inspection can be done, at this time click the ∠ set success;

Default:Click this button to restore the default settings.LX1S default memory capacity, Annotation capacity, Register file capacity 2000, 0, 0, respectivelyコLX2N default memory capacity, Annotation capacity, Register file capacity 8000, 0, 0, respectivelyコLX2N series memory capacity has 2000, 4000, 8000, 16000 four options.

EndチComplete the correct PLC parameter change, and setting.

CancelチCancel the PLC parameter settings and change before the parameter settings.

PLC System(2)チInterface is as follows:



- Protocol : Protocol Select
- Stop bit : Select stop bits
- Control line : Whether you need the control line
- Header : Whether you need the header
- Terminator : Whether you need the terminator
- H\W Type : Choose H\W type, the RS-232 or RS-485
- Station number setting : Set up the station number, range 00H~0FH(Hex)
- Control mode : Default
- Transmission speed : Choose the transmission speed
- Data length : Choose data length
- Parity Choice : Odd or even
- Sum check : Whether you need sum check
- Time out judge time : Set the timing out of judge time

- Transmission control procedure :Default

Interface button, instructions:

Check : Check the current settings, whether the "program capacity" is greater than zero. If program capacity is less than or equal to zero, the examination not through setting is not successful, and click the "End" button will be an error at this time. If program capacity is greater than zero, then inspection, click on the "End" set the success at this time.

Default : Click this button to restore the default settings.LX1S default memory capacity, Annotation capacity, Register file capacity 2000, 0, 0, respectively⊐LX2N default memory capacity, Annotation capacity, Register file capacity 8000, 0, 0, respectively⊐LX2N series memory capacity has 2000, 4000, 8000, 16000 four options.

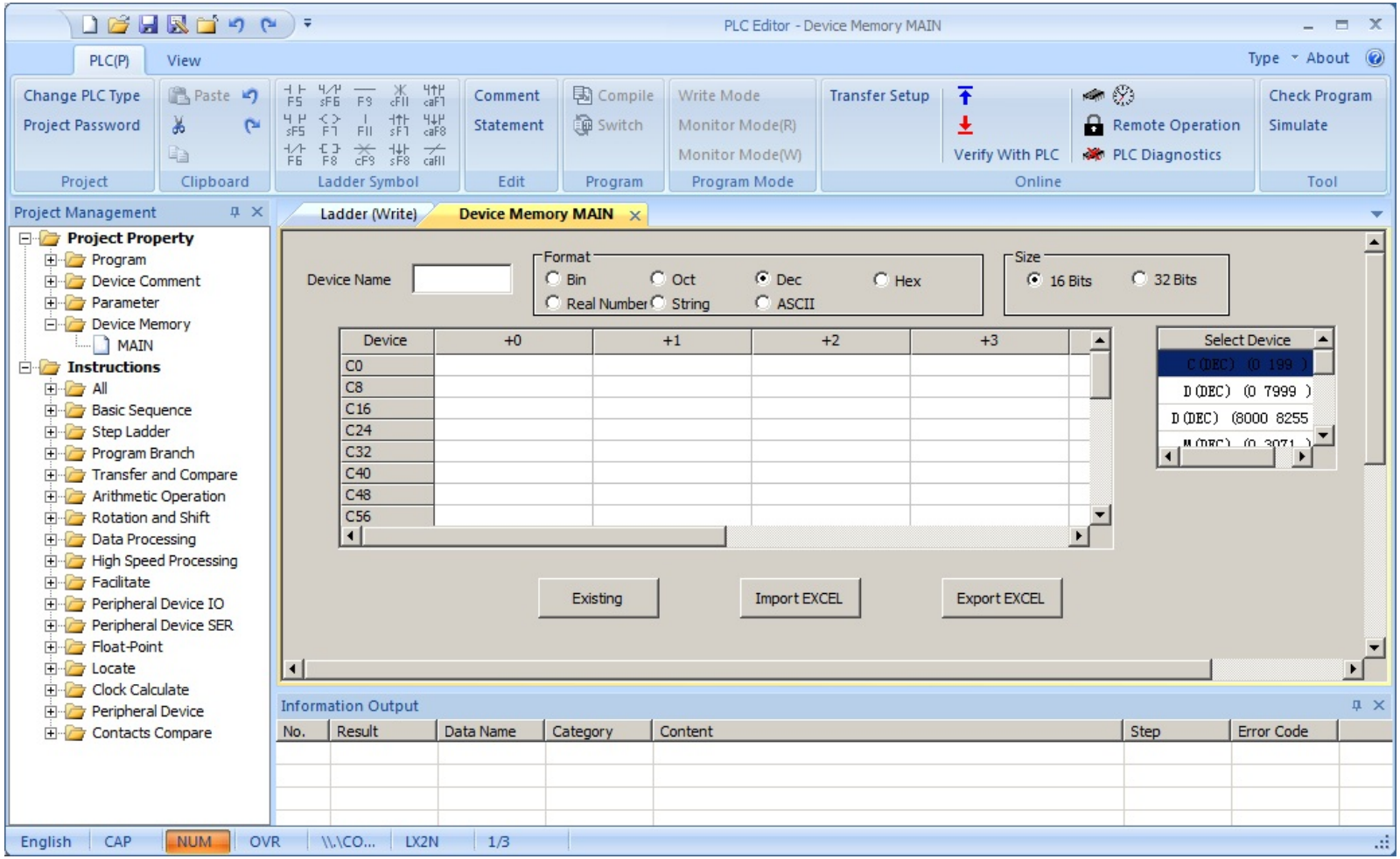
End : Complete the correct PLC parameter change and setting.

Cancel : Cancel the PLC parameter settings and change before the parameter settings.

Device Memory

Device memory : Download PLC is used to set the PLC data block data, PLC uploaded displayed when reading data from PLC data block.

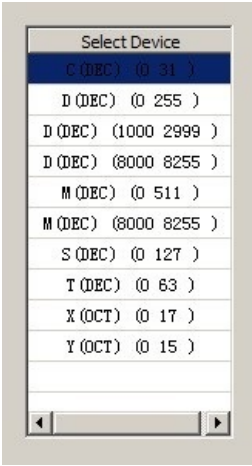
New device memory : The right mouse button to select "memory" soft element node -> "new", to create a new soft element memory file(file name any character, up to 33 characters in length, and each time can only download one).Distribution of interface is shown in figure 1 as follows:



Interface label, instructions:

Device name: Enter the device you want to search, press Enter to search and locate the component; you also can right click "search the device" in the editor area -> to search the location of soft component.

Divided into 9 interval C, D, M, S, T, X, Y, S, X, Y, interval of them can read an editor, M range can only enter 0 S and 1 S. The device range list belowチ



Editor areaチTo enter each interval to set value.

Coumn Formatチ7 kinds of data of Bin, Oct, Dec, Hex, real Numbers, strings, ASCII format; A format one color: Bin(Red), Oct(Pink), Dec(Blue), Hex(Brown), Real Numbers(Orange), strings(Blue Green), ASCII2(Green).

The transformation of different formats:

Method 1.Click on the select box format in different formats;

Method 2.The right mouse button -> display format -> choose to convert the format.

The matters need attention of various formats using :

- Binary can only input Numbers 0 or 1;
- Octonary only Numbers 0~8;
- Decimal number only Numbers 0 to 9.
- Hexadecimal can be 0~9 or a~f or A~F various combinations, such as 1af;
- Real number can only be 32 bit, need to selecte two cell ll click on the "32 bit" ll click on the "real" to edit the set of real Numbers;
- A string of hexadecimal characters, divided into visible characters, invisible characters;
- Visible characters can enter only two characters, example: input characters [#7e] is displayed for [~];
- Invisible Characters with "#" in front of the logo, example: input is invisible Characters [#7f] are shown as [#7f#00];

- ASCII input two characters.

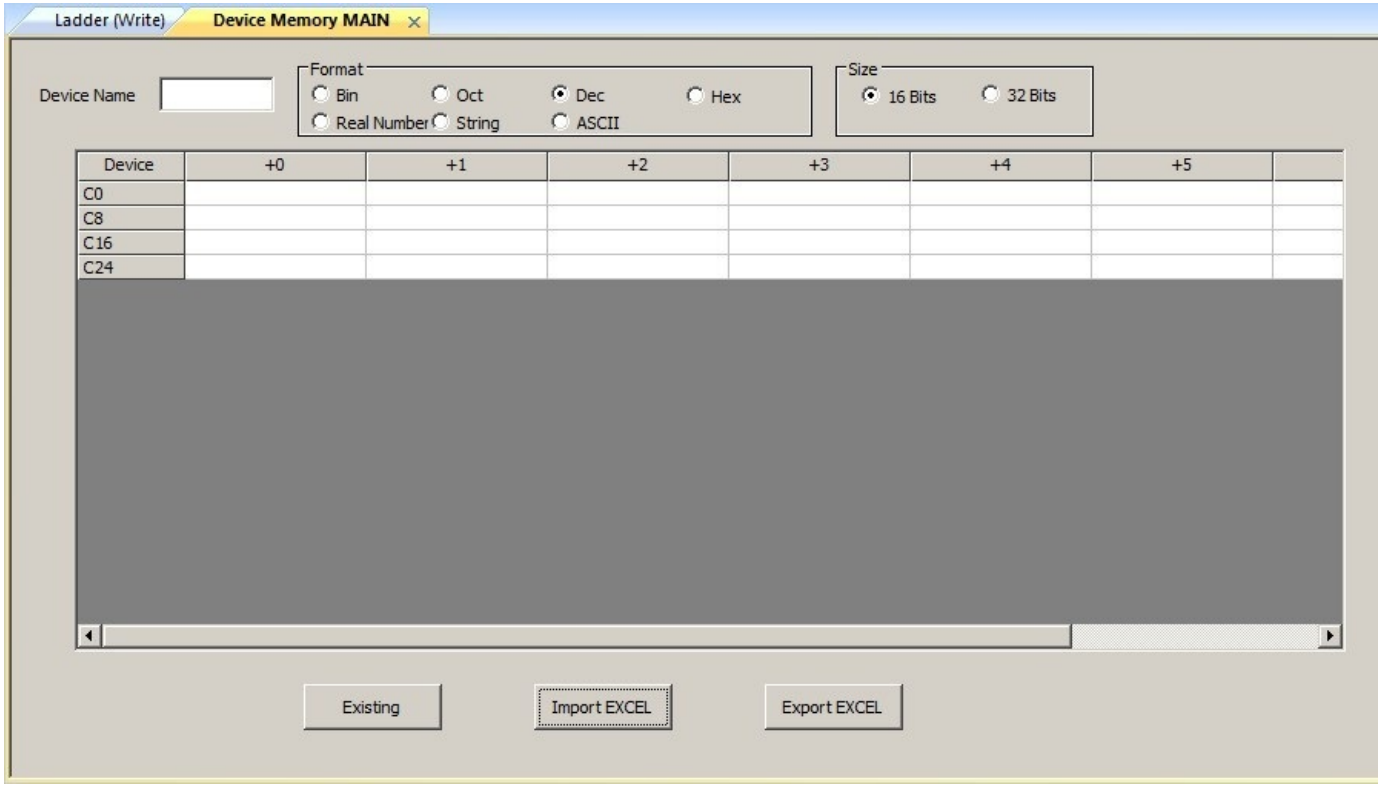
Data size: 16-bit and 32-bit

When the length of 16 bits each the size of the data format : Binary 0000000000000000~1111111111111111ヂb.Octonary 0~1777777ヂc.Decimal number -32768~32767ヂd.Hexadecimal 0~FFFFヂe.Strings two characters in lengthヂf.ascii two ascii code value.

When the length of 32 bits each the size of the data format : Binary 00000000 00000000 00000000 00000000~11111111 11111111 11111111 11111111ヂb.Octonary 0~37777777777ヂc.Decimal -2147483648~2147483647ヂd.Hexadecimal 0~FFFF FFFF FFFF FFFFヂe.Strings four characters in lengthヂf.ascii four ascii code valueヂg.Real numbers 圇1.1754946E-38~圇3.4028235E+38.

Interface button, instructions:

Displays all existing device of the input value and can be directly in the interface editor.

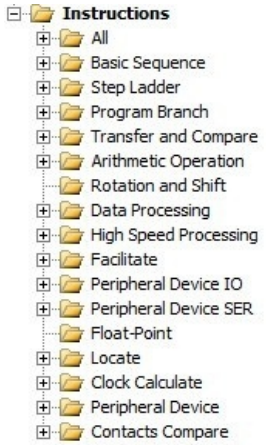


Import EXCEL : Can import edited from the local computer excel file (only excel spreadsheet), After successful imported there is display as "Show existing Device" interface.

Export EXECL : To the set value can be all of the soft components export to excel file stored in the local disk.

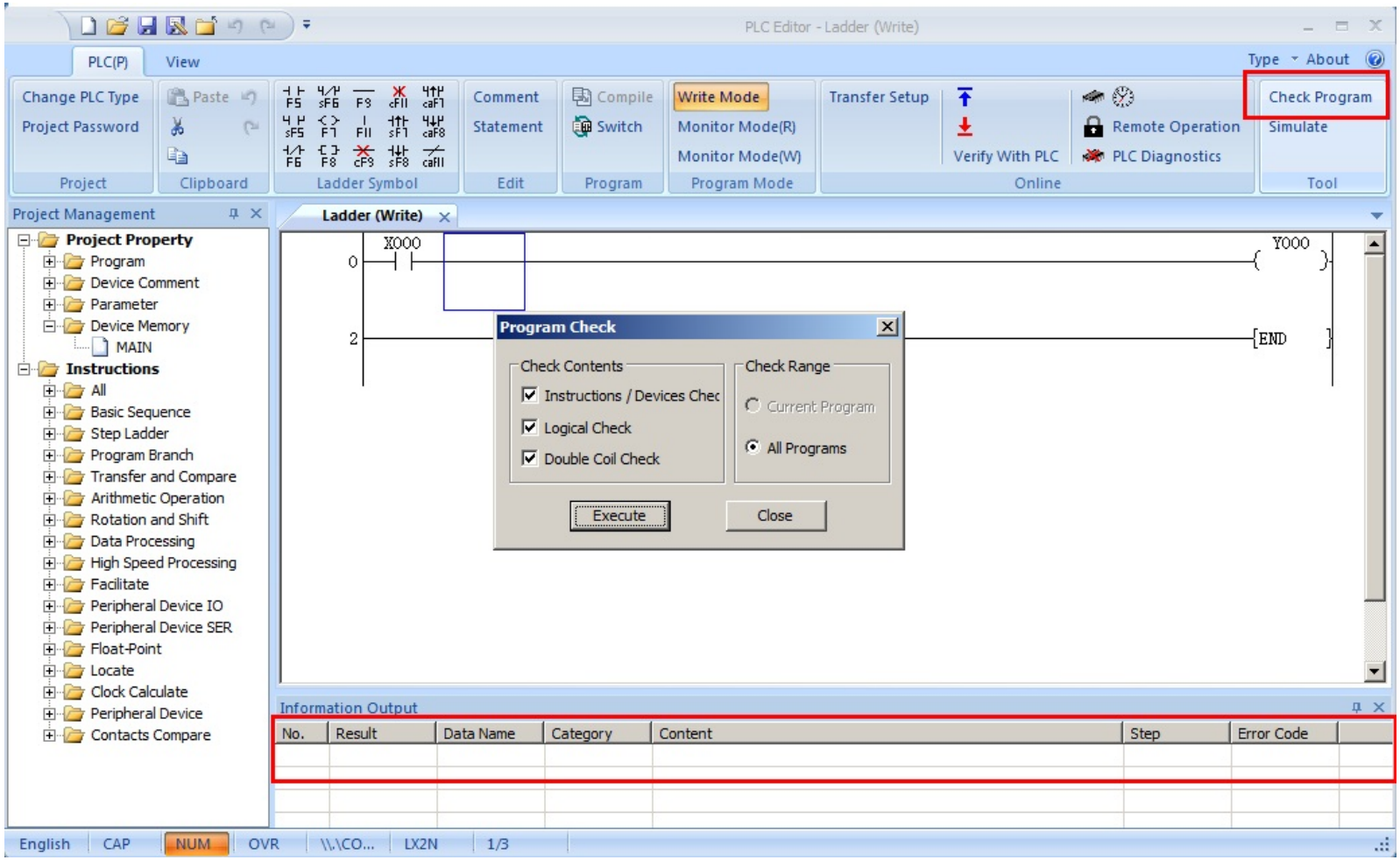
Instructions

Available instructionsチAll, Basic Sequence, Step Ladder, Program Branch, Transfer and Compare, Arithmetic Operation, Rotation and Shift, Data Processing, High Speed Processing, Facilitate, Peripheral Device IO, Peripheral Device SER, Float-Point, Locate, Clock Calculate, Peripheral Device, Contacts Compare.



Output Window

The information output window can provide the user with the results after software has executed the operations, including the result information of the three types of operation: compilation, communication and conversion.

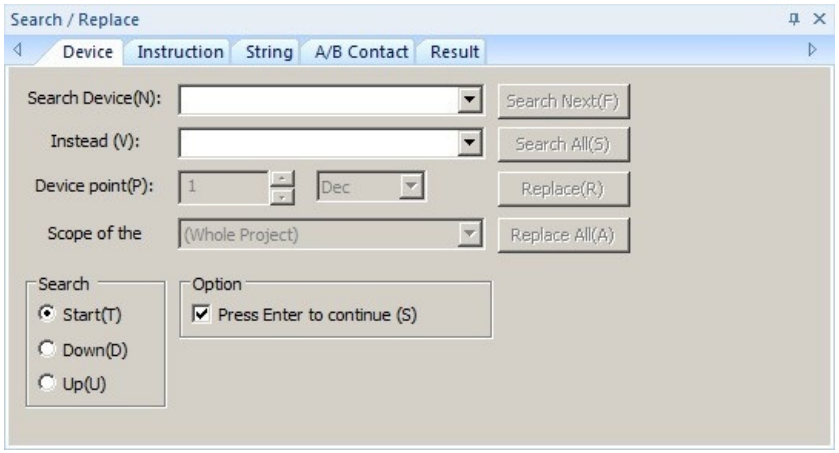


If there is no error in the program, the system will pop up "program right". If the program is wrong, then the "output" modules will be listed at the bottom of the figure the wrong place, select the specified the wrong project, double-click can locate to the ladder diagram the wrong position.

Search/Replace Function

Search-and-replace function, it is similar to the search-and replace function of MS OFFICE, can realize positioning in a large amount of data, the user can do the bulk addition, deletion, modification, search for the block data, that can greatly improve efficiency.

Method of use: Open the main program, build a new project, click on the [Ctrl] + [F4] in the keyboard, then pop up search-and-replace interface, as figure below.

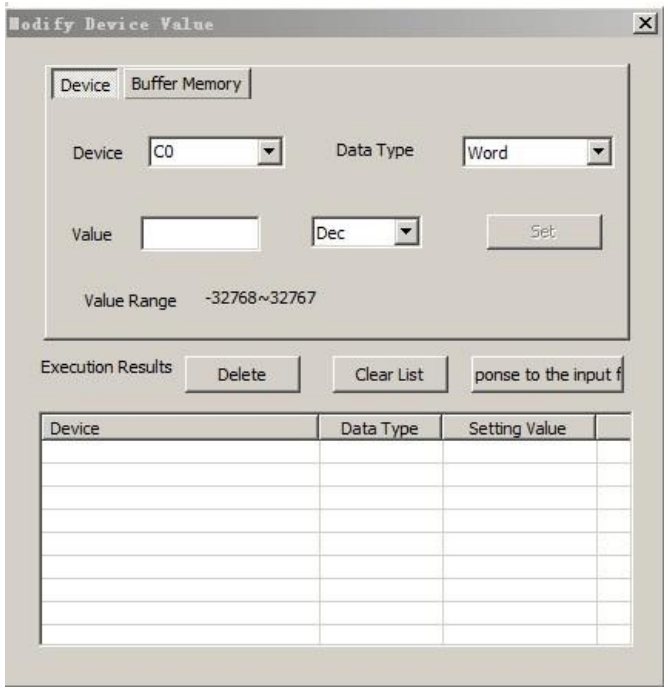


Buttons are divided into device, instructions, strings, A/B contact, results, 5 classes, as figure below; Click on any one will switch the corresponding interface.

Modify Device Value

"Modify Device Value" divide into modifying internal registers of the PLC;Coil value; modifying the register values of expansion equipment.

As the below



Detailed annotation of picture as below;

PLC Internal Device

/ a."Device" is the register,coil(such as C0,M1) of the data need to be modified in the range of plc.

b."Data type" include Word (single byte), Bit(binary 0 or 1), Double Word (double byte).

c." Value" is specific value that need to be modified.(corresponding to the number that is in the range of "data type"), such as -120.

d.Data format can be decimal (single byte -32768~32767,double byte -2147483648~2147483647) and hexadecimal(single byte0~FFFF,double byte 0~FFFFFFFF).

e. Click "Set" to save all valid setting.

√**The results of performing**:Recorded the －device－ ,－data type－,－setting value－ that revised successfully as list.

∝**Record list** :

Click any one in the list and click "Delete" to delete it.

Clicking "**Empty the list**". Then clear the records in the list.

Selected any one in the list, Click "**Reflected in the input field**"will reflect every item of /.

PLC circumscribed extension module.

a. "The start of module":The number of expansion module(such as 0 block).

b. "address" is writable address inside of expansion module.address type can be decimal or hexadecimal.

c. "data type" Including Word (single byte)┻Bit (binary 0 or 1)┻Double Word (double byte).

d. "value" It is specific numerical that will be modified.(correspondence "data type" number of the range), Such as -120; Type is is decimal or hexadecimal.

e. Range: decimal(single byte -32768~32767, double byte -2147483648~2147483647), and hexadecimal(single byte0~FFFF, double byte 0~FFFFFFFF).

f. Clicking "set" Writing the rightly seted value of the range into the selected device.

Note:

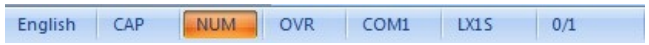
1. MotifyThe value of device must with PLC communicate to finish.

2. Devicemustin the range of the corresponding models of PLC.

3. Input valuemustwithin bounds decimal (single byte -32768~32767, double byte -2147483648~2147483647), hexadecimal(single byte0~FFFF, double byte 0~FFFFFFFF).

The status bar

Indicate language, status of capital letters and small letters, status of numeric keyboard lock, status of rewi/insert, COM port, engineering model, The steps of current program/total steps of program and so on.



Language : Language Type of Device display. Highlight means start using.

status of capital letters and small letters :status of english input.

numeric keyboard lock : Whether the numeric keyboard is available.

Write/insert mode :Ladder diagram edit mode.

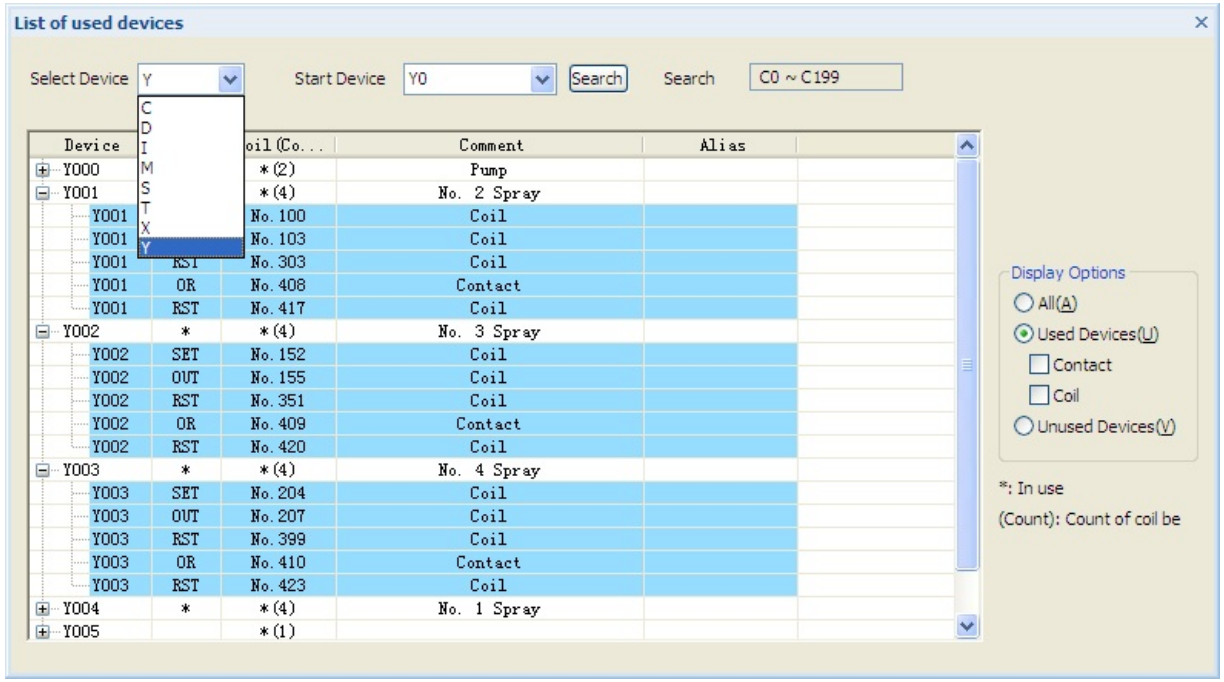
COM port :Communication COM port. Clicking it will popup window of Communication Settings.

Project Type :Showing the Plc type of current engineering.

The steps of current program/Total steps of program :The program's edit page, The program's steps of currently selected instruction/Total steps of program.

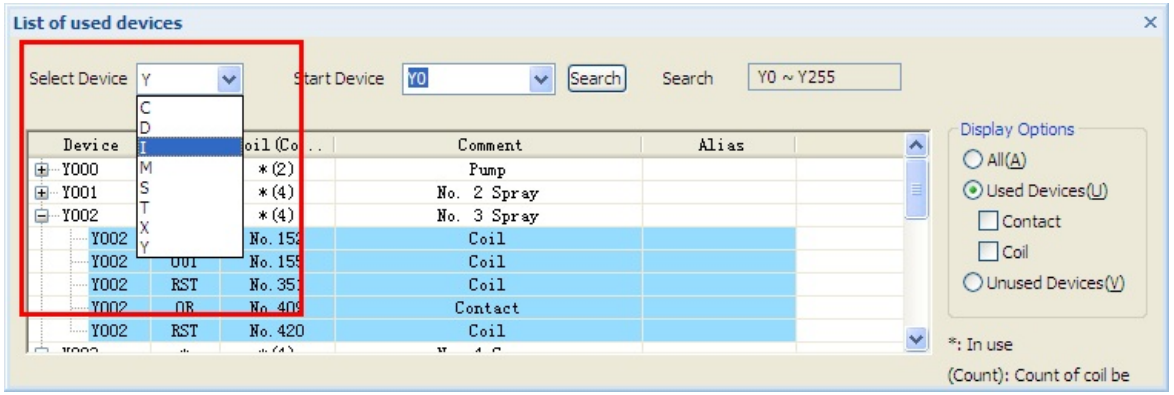
Soft components List

The soft component list is used to display the soft component of specified type. You can check its usage and edit it.

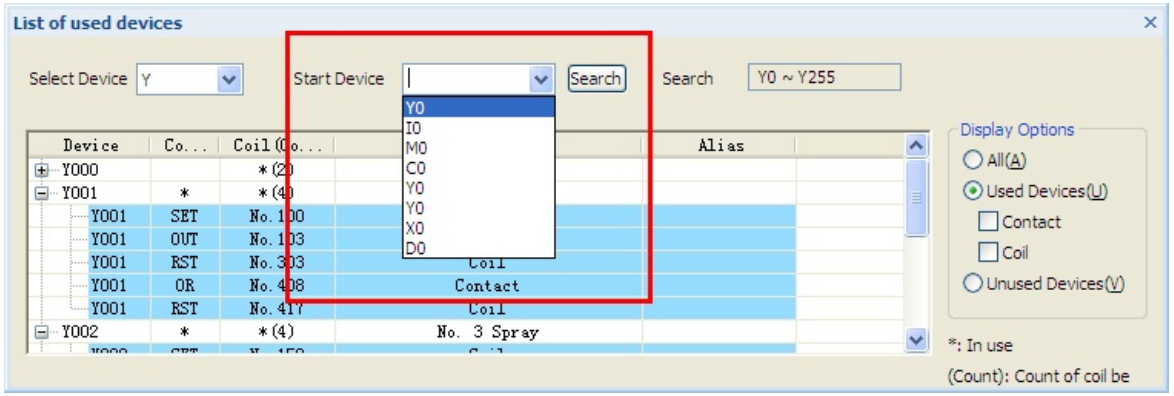


The instrusction

1. The soft coponent selection drop-down box : Select and diaplay the usage of the current soft component(from the NO.0) :

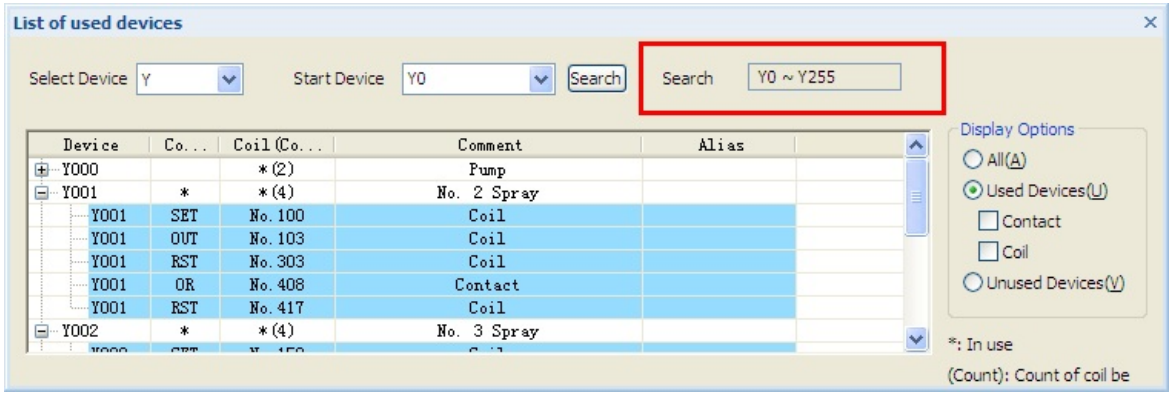


2. The initial soft component drop-down box: Input the full name or number of the soft component then click on Enter or the search button to select the usage(from the initial number).You can search again by the search records in the drop-down list.

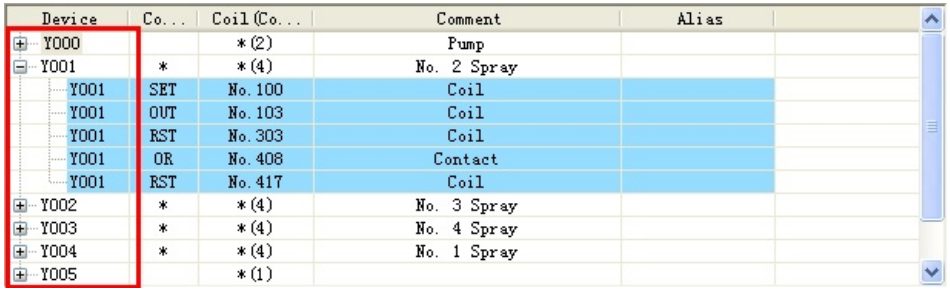


3. Search button: Search for what you want. If the initial soft component is empty, there will be a prompt to input the soft component.

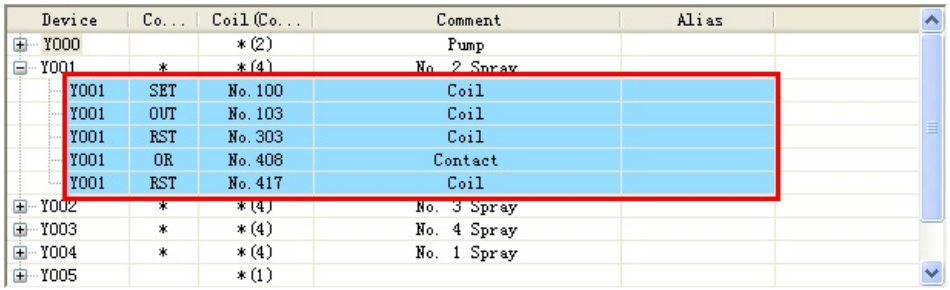
4. Search range: The search range displays automatically. It can not be edited.



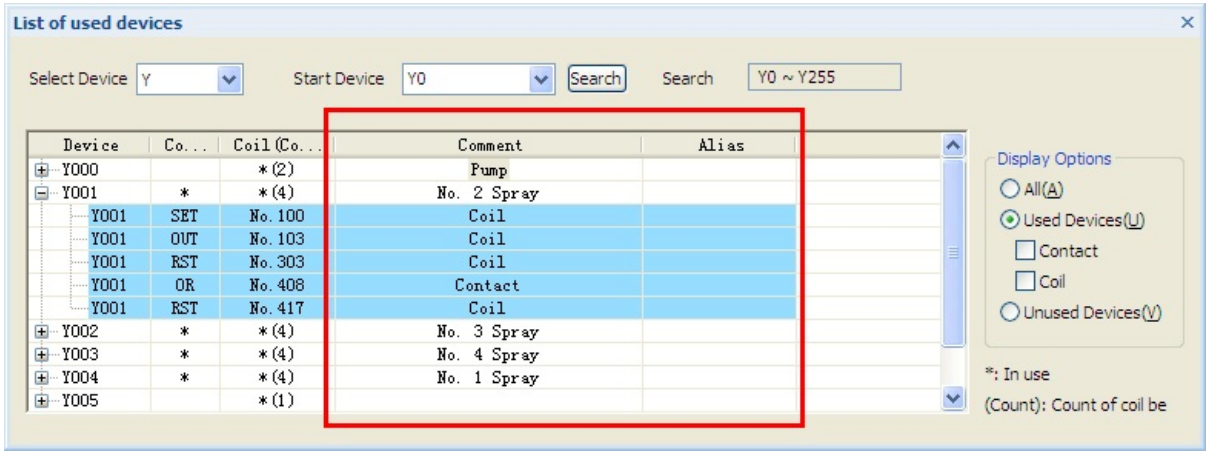
5. Use the list item to open and close the soft component.



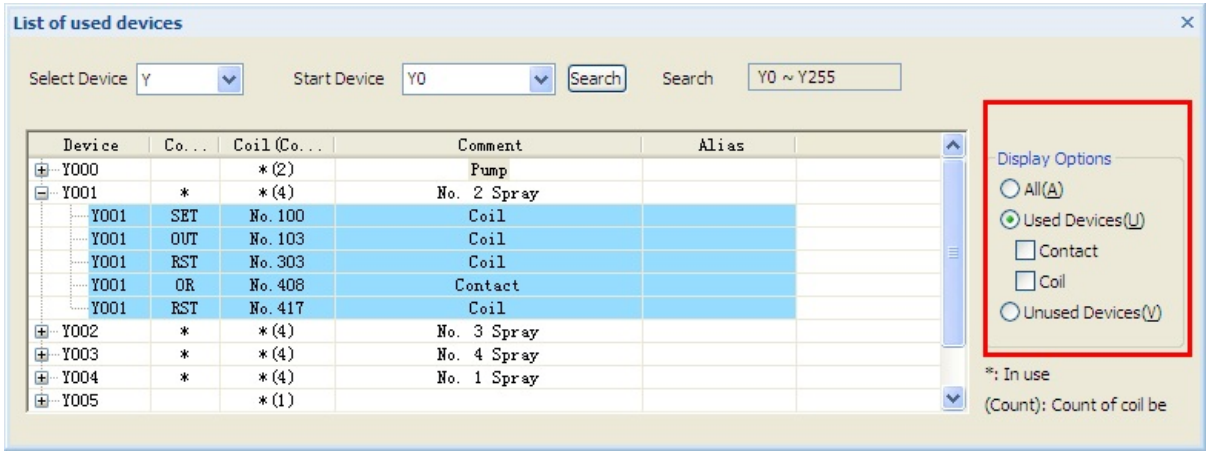
6. Soft component list item: includes the commands, steps, and the type in the soft component peogram.



7. Soft component annotation and alias column:(the backgroud is white). Double click to edit the annotation and the alias.



Dispaly options



1. All soft cpomponent: Select the soft component of this kind after it is selected.

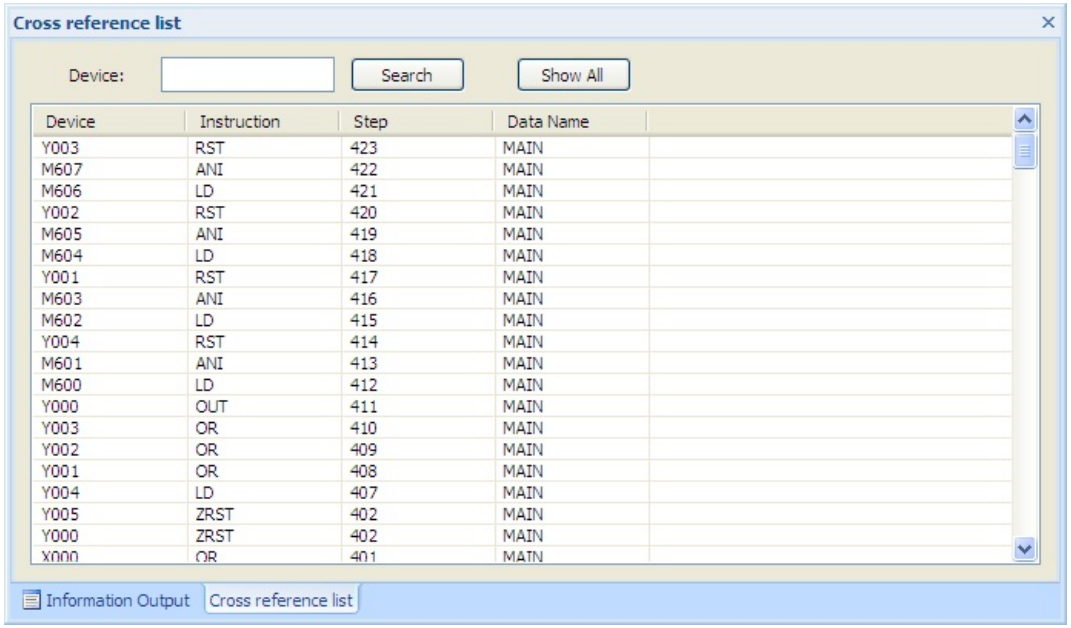
2. Use the soft componnet: according to the contatc and the coil options, select the soft component used of this type after it is selected.

- When no contact and coil checked, it will display all the soft component of this type.
- When contact(coil) checked, it will display the soft component of the contact(coil) type in the program.
- When both the contact and the coil checked, it will display the soft component of the contact and coil in program.

3. No soft component: It will dispaly the soft component whose type is not used in the program.

Comparison table

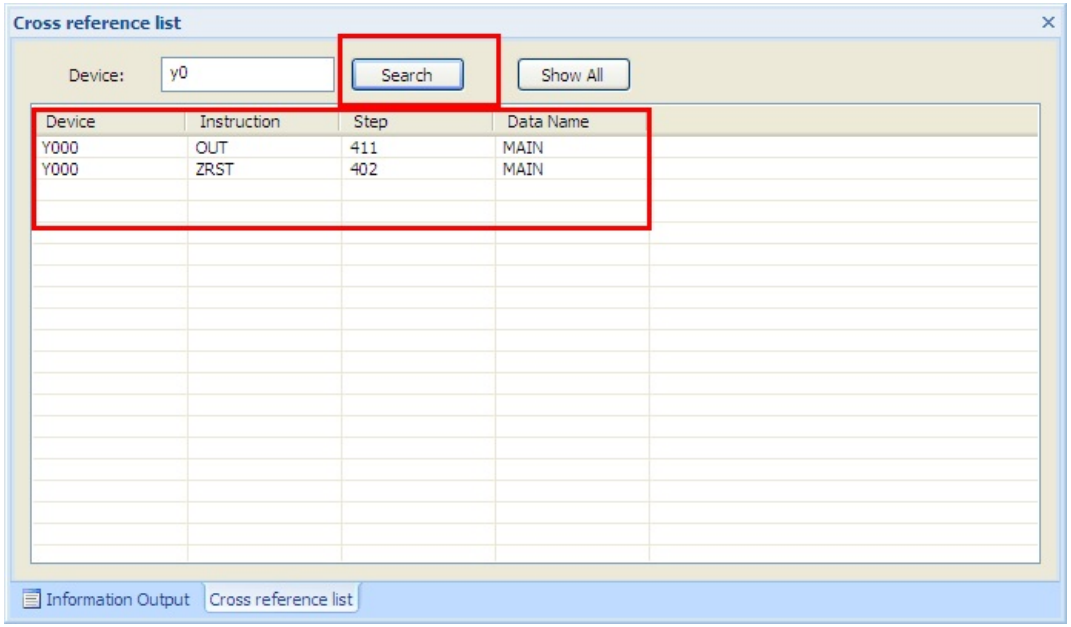
The comparison table is used to show the usage of the specified soft component or the all soft component.



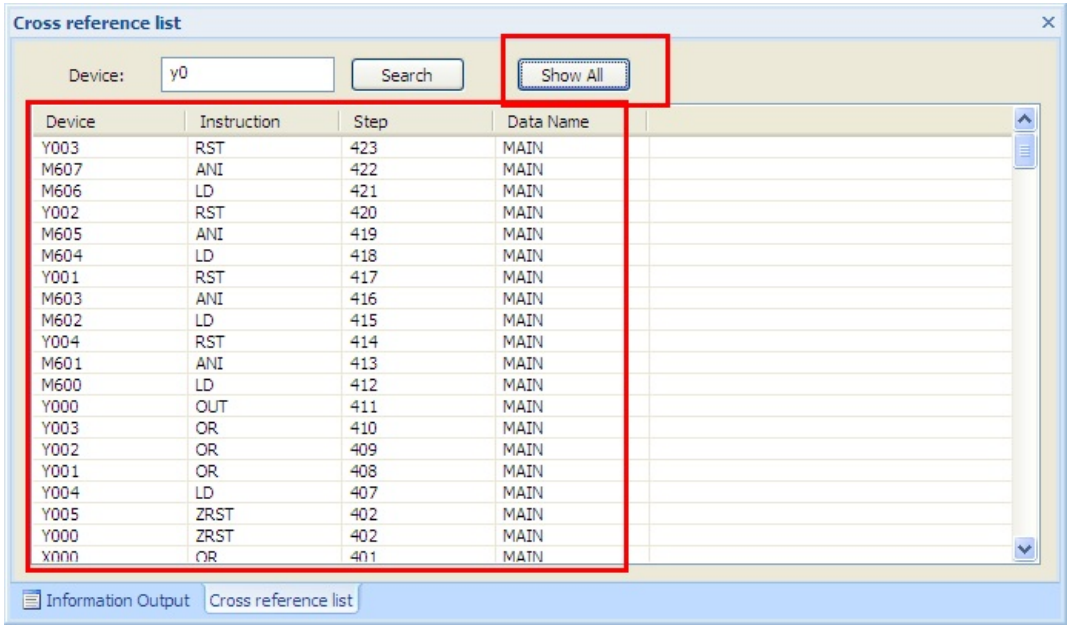
The instructions

1. Soft component input box: input the name of the the soft component wanted then click on the Enter or search button to select its usage.

2. Search button: Search for waht you want.



3. Display all buttom: Display all the soft component and all the commands.



Types of software components

PLC is supported by the soft component types in the following table:

SN	Component Type	Features and classification
1	Input Relay X	PLC hardware corresponding bit component digital inputs
2	Output Relay Y	PLC control output corresponding to digital components
3	Intermediate relay M	Common intermediate relay M-bit components; system special relay M-bit components
4	State relay S	Step control components with status flag
5	Timer T	With 1ms, 10ms, 100ms step of 16bit timers
6	Counter C	With 16bit/32bit up / down type counter, high-speed counter, single / duplex various counter
7	Data register D	Data register D; data register indirect addressing V, Z, D register file
8	Pointer P┴I	Jump pointer P, subroutine pointer P, interrupt subroutine I, a high-speed input, timing, counting and other interruptions
9	Constant K┴H	Binary, decimal, hexadecimal, floating point, etc.

Input relay X

The input relay X represents the PLC status of the external input signal components. And it can get through the input port to detect the external signal status. 0 is for external signal open circuit, and 1 closed.

It cannot modify the state input relays in the way of program instructions. Contact signal (normally open, normally closed type) program can be used an unlimited amount of times by the user.

The number of Relay signals is X0, X1…X7, X10, and X11 and so on. The serial number is in octal numbers. Controller counter signal, external interrupt, pulse catch functions through the input port X0ㅢX7.

Type	Input	Output
LX1S-14MR/MT	8 point	6 point
LX1S-20MR/MT	12 point	8 point
LX2N-32MR/MT	16 point	16 point
LX2N-40MR/MT	24 point	16 point
LX2N-60MR/MT	36 point	24 point

Output relay Y

Output relay is directly related to the external user to control the hardware port of the software component. It corresponds to the physical output port of PLC. The component status of relay Y will be sent to the state of the hardware port on the PLC. 0 indicates that the output port is open, and 1 closed.

The number of relay Y is Y0, Y1,...Y7, Y10, Y11 and so on. The number sequence is in octal numbers. Relay device in the user program can be used an unlimited number of times.

The hardware can be divided into the following categories: relay type, transistor type, solid state relay type, etc. according to different output devices. If it has the output expansion module port, relay Y will be numbered sequentially from the main module.

Auxiliary Relay M

Auxiliary Relay M components is used as an intermediate variable during the execution of a program, as auxiliary relays in the practical power control system which is used to transfer the status messages. It can use the word variable formed by M variables. M variables is not directly linked with any external ports, but it can contact with the outside world by the manners of copying X to M or M to Y through the program coding. A variable M can be used repeatedly.

Auxiliary Relay M can be identified with the symbols of M0, M1,...,M8255. The numbering system is numbered by 10 hex. The variables that are more than M8000 are the system-specific variables,which is used to interact with the PLC user program with the system status; part of the M variables have the feature of power-saving,

Type	General	Latched	Latched specifically	Special
LX1S	M0-M383 384 Point’3	-	M384-M511 128 Point’3	M8000-M8255 256 Point
LX2N	M0-M499 500 Point’1	M500-M1023 524 Point’2	M1024-M3071 2048 Point’3	M8000-M8255 256 Point

Tip1: Non-latched area. The non-latched area can be changed to a latched area with the parameter setting.

Tip2: Latched area. The latched area can be changed to a non-latched area with the parameter setting.

Tip3: Cannot change the characteristics in order to maintain the power-off by parameter setting.

The regional distribution of the generally used auxiliary relays and the auxiliary relays that are latched in the programmable controller can be adjusted by adjusting the settings in the parameter.

Programmable controller has a large number of special auxiliary relays. Each one of them has their specific functions which can be categorized into the following types:

1) The special auxiliary relays used for contacts. For instance:

M8000: Operating monitor (connected in operation). It is commonly used before the command signal execution.

M8002: The initial pulse (only connect shortly at the beginning of operation), it is commonly used as the initialization command.

M8012: 100ms clock pulse. It is used to generate a signal at during regular interval flips.

2) Coil-driven special auxiliary relays provide driven coils for user programs, and it is used to control the operating status and the status of execution of the PLC. For instance:

M8030 : The command for battery lighting and polar tube lighting.

M8033 : Continue exporting when stopping

M8034 : Total ban on export

M8039 : Constant Scanning

Note:

M component is effective when there is a driver and two cases after the execution of the END command; users cannot use the special auxiliary relays that have not yet been defined.

State relays S

State relays S is used to design and handle step procedures, control the transfer steps of the state S by STL step instructions, and simplify programming. If there is no way of using STL programming, S can be used as M. S variables are identified with S1...S999 and so on. The serial number is a decimal number. Part of the S variable has the function of power-down save.
See the following table:

Type	General			Latched			Alarm
	General	**Initialization**	function of getting back to origin point under IST command	**Latched**	**Initialization**	function of getting back to origin point under IST command	
LX1S	-	-	-	S0-S127 128 Point’3	S0-S9 (10 Point)	S10-S19 (10 Point)	-
LX2N	S0-S499 500 Point’1	S0-S9 (10 Point)	S10-S19 (10 Point)	S500-S899 400 Point’2	-	-	S900-S999 100 Point’2

Tip1: No latched area. Parameter settings can be changed through the power outage to maintain the leading city.

Tip2: Latched area. Parameters can be changed by setting the leading city of non-latched.

Tip3: Latched features. It can not be changed by setting the parameters.

Timer T

The timer is used to perform the timing function. Each timer contains coils, contacts, and counting time value register. When the coil sounds (with sufficient power), the timer starts timing. If the timer's registered value reaches the preset value, the contacts activate, and other contacts (NO contacts) are closed, while b contacts (NC contacts) disconnect. If the coil power shuts off (insufficient power), the contacts will restore to their initial states and the value will automatically be cleared. Some timers have the feature of accumulation and shut-down.After a restart, it will even keep the value before the shut--down.

Timer T is expressed by the symbol of T0, T1, ... T255. **I**ts serial number is in 10 decimals.

Timers have different timing steps. For instance, 1ms, 10ms, 100ms, and etc. See the following:

Type	100ms 0.1~3276.7s	100ms 0.01~327.67s	10ms 0.01~327.67s	1ms retentive 0.001~32.767s	100ms retentive 0.1~3276.7s
LX1S	T0-T31 32 Point	T32-T62 31 Point	T32-T62 31 Point	T63 1 Point	-
LX2N	T0-T199 200 Point General application T192-T199	-	T200-T245 46 Point	T246-T249 4 Point Keeping the interrupt	T250-T255 6 Point Holding

Tip:

The timer number is not for the timer, and it can be used as a data register to save values.

Counter C

The counter is used to complete a counting function, and each counter contains a coil, contacts, and time value register. When the counter coil drives a signal from the OFF to ON, the value of the counter is increased by 1. If the time value reaches the preset time value, the contacts act, Contact a (Contact NO) closed, Contact b (Contact NC) disconnected. If the timer value is cleared, output of Contact a is broken, Contact b (Contact NC) closed. With power-down to maintain a cumulative and other characteristics, after re-powering, some of the counters can maintain the value before powering-down.

Counters are identified by C0, C1, ..., C255, ordered by 10 hexadecimal numbers.

Counters have the width of 16bit and 32bit. There are the single-way counting type, change counting type, bipolar counting type, etc. Some of the counters have the option to maintain values when powered-down. Select the appropriate counters according to need when using.

Type	16bit counters 0~32,767		32bit counters -2,147,483,648~+2,147483647	
	General	Latched	Latched specifically	Special
LX1S	C0-C15 16 Point' 3	C16-C31 16 Point' 3	-	-
LX2N	C0-C99 100 Point' 1	C100-C199 100 Point' 2	C200-C219 20 Point' 1	C220-C234 15 Point' 2

1 Non-latched area. The non-latched area can be changed to a latched area with parameter setting.

2 Latched area. The latched area can be changed to a non-latched area with parameter setting.

3 You cannot choose the option to maintain a value when powered-down by parameter setting.

Tip:

A counter number not used as a counter, can be used as a data register to store data.

Register D

Data Register D

The register is used for data computation and storage • items such as timers, counters, and analog parameters of the operation. Each register is 16 bits wide. If using the 32-bit instructions, it will be composed of adjacent registers to use as a 32-bit register.The address low byte is low byte, and the opposite is high byte.

In LX series PLC's instructions, the majority of the data is carried out by a number of processed symbols.For the 16-bit register, bit-15 is the sign bit (0 for positive numbers; 1 for negative numbers).As for the 32-bit register, high byte bit-15 is the sign bit.The range of values is : from (-32 , 768) to (+32, 767).

When the data need to be addressed as 32-bit, it can be as two adjacent D registers composed of 32- bit double word. For example, when we need to visit D100 in a 32-bit format, the high-address register D101 is high byte, and the high byte of 15 is a two-word sign bit.The following values can be handled: -2 , 147 , 483 , 648 to 2 ,147 , 483 , 647.

The register is identified with D0, D1, ..., D9, 999, carried out according to the decimal number.

Type	General	Latched	Latched specifically		Special	Designated
			-	File		
LX1S	D0-D127 128 Point’ 3	-	D128-D255 128 Point’ 3	According to parameter setting, D1000-D2499 can be used as a file register	D8000-D8255 256 Point	V0-V7 Z0-Z7 16 Point
LX2N	D0-D199 200 Point’ 1	D200-D511 312 Point ’ 2	D512-D7999 7488 Point’ 3	According to parameter setting,after D1000 can be used as a file register	D8000-D8255 256 Point	V0-V7 Z0-Z7 16 Point’ 3

Tip1: No latched area.Parameters can be changed by setting the field latched.

Tip2: Latched area.Parameters can be changed by setting the field of non-latched.

Tip3: It cannot be changed by setting the parameters' latched features.

Index Register V, Z

Index register V, Z is the same as the common data register, which is for the numerical data to read and write a 16-bit data register. It is a total of 64: V0~V31, Z0~Z31.

The index register has the same use as the common data register, and it also can be used with other numbers or values of soft components.But we need to be aware that LD, AND, OUT, and other basic sequential control commands or a step ladder program cannot be a soft component number used in combination with the index register.

File register D

After data register D1000, it is the register to remain. Through parameter settings, it can be specified from 1 to 14 blocks for the backup file. But a record for each additional block of 500 steps of the procedure would reduce the storage area. When part of the D1000 is set to file register, the rest can still maintain a register used as a general one.

Pointer L, I

Point L is applied as the entry address of jump routines and as well as the label of subroutine starting addresses; Pointer I is applied as the label of starting address of interrupt routines, and its codes are allocated to decimal digit as the table below shows:

Type	Branch		Insert and Input	Insert	Counter interrupt
	None	End Jump			
LX1S	P0-P62 63 Point	P63 1 Point	I00_(X000) I10_(X001) I20_(X002) I30_(X003) I40_(X004) I50_(X005) 6 Point	None	None
LX2N	P0-P62 P64-P127 127 Point	P63 1 Point	I00_(X000) I10_(X001) I20_(X002) I30_(X003) I40_(X004) I50_(X005) 6 Point	I6__ I7__ I8__ 3 Point	I010 I020 I030 I040 I050 I060 6 Point

Note:When an interrupt timer (1 msec resolution) is used in an interrupt routine or within a ‘CALL’ subroutine, the output contact is activated when the first coil instruction of that timer is executed after the timer has reached its preset (maximum duration) value.

Constant K,H,E

According to different application and purposes, LX series programmable controller uses 5 types of values. Their role and functions as follows:

Type	Application Notes in Programming
Decimal (DEC)	The set value of timer and counter (K is a constant) The number of Auxiliary Relay(M), Timer(T), Counter(C), Status(S) and so on (the number of soft component) The value and command action in the Operand, which are applied (K is a constant)
Hexadecimal number (HEX)	As with the 10 decimal number, it is applied in the operand and the specific actions in the application commands.
Binary (BIN)	Using decimal number or hexadecimal number to design the value of the timer, counter or data register. However, in the internal programmable controller, these figures are dealt with binary numbers. Moreover, when monitoring external devices ⊐ these soft components will be converted to a decimal number automatically (16 hex can be converted as well)
Octal (OTC)	Using 8 hex values to distribute the soft component number of Input relay and output relay. Use the binary values of [0-7, 10-17, ... 70-77, 100-107]. [8, 9] does not exist in the 8 hexadecimal number.
BCD	BCD is a way of using 4-bit binary to represent decimal values. The processing of these numbers is simple. Thus, it can be used in the digital switch of BCD output format and the display control of seven segments.
BIN float	Programmable controller has the function of high-precision floating point capabilities. In the center, use binary (BIN) floating-point to conduct floating-point operations
Decimal floating point	Decimal floating-point value is only used for monitoring and improving readability.

Constant K

[K] is the symbol that expresses the 10 decimal integer. It is used to set the value of the timer, the counter, and the value in the operand. In the 16bit commands, the constant K

ranges from -32768 to 32767; in the 32bit commands, the constant K ranges from -2,47,483,648 ~ 2,147,483,647.

Constant H

[H] is the symbol that expresses the 16 decimal integer. It is used to set the values in the application command operand. Constant H ranges from 0000 ~ FFFF;in the 32bit commands, the constant K ranges from 0000,0000 to FFFF, FFFF.

Constant E

[E] is the representation of a 32-bit floating point. It is used to set the values in the application command operand.

Special system component

M8000~M8255 ㄱ D8000~D8255 are defined as special components of which functions are described as following:

M component	M component description	D component	D component description
System operation status			
M8000	ON when user program is running	D8000	Monitor timer of user program operation
M8001	M8000 status is inverted	D8001	Single board program version, for example 24100 2N= 24, 1S = 22,100 version V1.00
M8002	ON during first period of user program	D8002	Program capacity, 4K, 8K and 16K etc.
M8003	M8002 status is inverted	D8003	Fixed value 0X10, internal memory of PLC
M8004	If any of M8060~M8067 [except for M8062] is ON then M8004 is effective	D8004	Wrong BCD value of M8060~M8067, normally 0
M8005	Actuated when battery voltage is too low	D8005	BCD current value of battery voltage
M8006	Actuated when battery is too low [latch]	D8006	Threshold value of low battery voltage detection, initial value is 2.6V
M8007	AC power lost for 5ms then M8007&M8008 will be actuated, but the program continue running within D8008	D8007	Time of saving M8007 actions, reset to 0 when power is lost
M8008	If the power is lost within D8008, then the user program will stop running when M8008 changes from ON?úOFF. M8000 is OFF	D8008	AC power lost detection time, default 10ms
M8009	Actuated when the extension unit loses 24V power	D8009	Module number of extension unit which loses 24V power
System clock			
M8010	reserved	D8010	Current scan time, from step 0 of user program (0.1 ms)

M8011	Clock oscillator of which period is 10ms	D8011	Minimum scan time (0.1 ms)
M8012	Clock oscillator of which period is 100ms	D8012	Maximum scan time (0.1ms)
M8013	Clock oscillator of which period is 1s	D8013	Clock second (0~59)
M8014	Clock oscillator of which period is 1 minute	D8014	Minute of Real-time clock (0~59)
M8015	Clock stop and preset	D8015	Hour of Real-time clock (0~23)
M8016	Stop clock read and display	D8016	Day of Real-time clock (1~31)
M8017	?à30 seconds correction	D8017	Month of Real-time clock(1~12)
M8018	Installation detection	D8018	Year of Real-time clock(2000~2099)
M8019	Real-time clock (RTC) error	D8019	Week of real-time clock
Instruction flags			
M8020	Operation Zero flag	D8020	Input filter constant 0~60 of X000~X007 [default 10ms]
M8021	Operation Borrow flag	D8021	Reserved
M8022	Operation Carry flag	D8022	Reserved
M8023	Reserved	D8023	Reserved
M8024	BMOV instruction direction	D8024	Reserved
M8025	HSC instruction mode	D8025	Reserved
M8026	RAMP instruction mode	D8026	Reserved
M8027	PR mode	D8027	Reserved
M8028	Reserved	D8028	The same address with Z0
M8029	Instruction (PLSR and so on) execution complete	D8029	The same address with V0
PLC operation mode			
M8030	If it?¯s ON then even battery voltage is low the alarm BATT.V LED not lit	D8030	Reserved
M8031	Non-latch memory all clear when it's ON	D8031	Reserved
M8032	Latch memory all clear when it's	D8032	Reserved

M8032	ON	D8032	Reserved
M8033	When ON memory hold in "stop" mode	D8033	Reserved
M8034	When ON all PLC output is OFF state	D8034	Reserved
M8035	Forced operation command 1	D8035	Reserved
M8036	Force operation command 2	D8036	Reserved
M8037	Force stop command	D8037	Reserved
M8038	Communication setup flags	D8038	Reserved
M8039	Constant scan mode	D8039	Constant scan time,default 0, the unit is ms
Step ladder flag			
M8040	STL transfer disable	D8040	Up to 8 active STL states, from the range S0 to S899, are stored in D8040 to D8047 in ascending numerical order.
M8041	Transfer start	D8041	
M8042	A pulse output is given in response to a start input	D8042	
M8043	ON during the last state of ZERO RETURN mode	D8043	
M8044	ON when the machine zero is detected	D8044	
M8045	Disables the "all output reset" function when the operation mode is changed	D8045	
M8046	ON when STL monitoring has been enabled (M8047) and there is an active STL state	D8046	
M8047	When ON D8040 to D8047 are enabled for active STL step monitoring	D8047	
M8048	When M8049 is ON, anyone from S900~S999 is enabled.	D8048	Reserved
M8049	When ON D8049 is enabled for active annunciator state monitoring	D8049	save S900~S999's alarm min. address No.
Interrupt control flags			
M8050	Drive I00?? interrupt disabled	D8050	Reserved
M8051	Drive I10?? interrupt disabled	D8051	Reserved
M8052	Drive I20?? interrupt disabled	D8052	Reserved

M8053	Drive I30?? interrupt disabled	D8053	Reserved
M8054	Drive I40?? interrupt disabled	D8054	Reserved
M8055	Drive I50?? interrupt disabled	D8055	Reserved
M8056	Drive I6???? interrupt disabled	D8056	Reserved
M8057	Drive I7???? interrupt disabled	D8057	Reserved
M8058	Drive I8???? interrupt disabled	D8058	Reserved
M8059	Drive counter interrupt disabled	D8059	Reserved

Error detection devices					
components	name	Program error LED	PLC status	component	Register contents
M8060	I/O configuration error []	OFF	RUN	D8060	The first I/O number of the unit or block causing the error
M8061	PLC hardware error	Flash	STOP	D8061	Error code for hardware error
M8062	PLC communication error	OFF	RUN	D8062	Error code for Communications error
M8063	Parallel link/ general communication error	OFF	RUN	D8063	Error code for parallel link error
M8064	Parameter error	Flash	STOP	D8064	Error code identifying parameter error
M8065	Syntax error	Flash	STOP	D8065	Error code identifying syntax error
M8066	Program error	Flash	STOP	D8066	Error code identifying program construction error
M8067	Operation error	OFF	RUN	D8067	Error code identifying operation error
M8068	Operation error latch	OFF	RUN	D8068	Operation error step number latched
M8069	Reserved			D8069	Step numbers for found errors corresponding to flags M8065 to M8067

High speed ring counter			
M8099	High speed ring counter	D8099	[0 to 32767] increased action ring counter (0.1

M8099	operation	D8099	action ring-counter (0.1 ms)
Miscellaneous Devices			
M8100	SPD(X000)- pulse numbers/minute	D8100	Reserved
M8101	SPD(X001)- pulse numbers/minute	D8101	Single board program version, for example 24100 H2U = 24, 100 version V1.00
M8102	SPD(X002)- pulse numbers/minute	D8102	Program capacity provided by system to user program
M8103	SPD(X003)- pulse numbers/minute	D8103	Reserved
M8104	SPD(X004)- pulse numbers/minute	D8104	Acceleration time when executing DRVI and DRVA [default 100], M8135 determines that it?¯s whether effective or not [Y0]
M8105	SPD(X005)- pulse numbers/minute	D8105	Acceleration time when executing DRVI and DRVA [default 100], M8135 determines that it?¯s whether effective or not [Y1]
M8106	Reserved	D8106	Acceleration time when executing DRVI and DRVA [default 100], M8135 determines that it?¯s whether effective or not [Y2]
M8107	Reserved	D8107	Acceleration time when executing DRVI and DRVA [default 100], M8135 determines that it?¯s whether effective or not [Y3]
			Acceleration time when executing DRVI and DRVA [default 100]

M8108	Reserved	D8108	DRVA [default 100], M8135 determines that it?¯s whether effective or not [Y4]
M8109	Output refresh error	D8109	Output refresh error address number
COM2 communication link			
M8120	Reserved	D8120	Communication format, the interface configuration with a default of 0
M8121	Sending and waiting (RS instruction)	D8121	Station number settings, the interface configuration settings with a default of 1
M8122	Sending flag (RS instruction) Instruction execution status(MODBUS)	D8122	Amount of remaining data to be transmitted (Only to RS instruction)
M8123	Receiving complete flag (RS) Communication error flag (MODBUS)	D8123	Amount of data already received (Only to RS instruction)
M8124	Receiving (only to RS instruction)	D8124	Start character STX (Only to RS instruction)
M8125	Reserved	D8125	Termination character ETX (Only to RS instruction)
M8126	Reserved	D8126	Communication protocol, the interface configuration with a default of 0
M8127	Reserved	D8127	Computer link protocol of data starting address
M8128	Reserved	D8128	Computer link protocol sending data amount
M8129	timeout judgement	D8129	Communication overtime judgement,? the interface configuration settings with a default of 10¬¨100ms¬?
High speed & positioning			
			Special bit for high

M8130	Control mode of HSZ instruction platform	D8130	Special bit for high-speed model (record number)	
M8131	Paralleled with M8130	D8131	HSZ & PLSY completion mark of comparison mode (record number)	
M8132	HSZ&PLSY speed mode	D8132	HSZ & PLSY frequency control mode	Low
M8133	Paralleled with M8132	D8133		High
M8134	Reserved	D8134	Completion mark for HSZ & PLSY frequency control mod	Low
M8135	Y0 speed-down time and pulse output can be change to be enabled [ON-PLSR,DRVI,DRVA]	D8135		High
M8136	Y1 speed-down time and pulse output can be change to be enabled[ON-PLSR,DRVI,DRVA]	D8136	The total number of Y000&Y001 output pulses	Low
M8137	Y2 speed-down time and pulse output can be change to be enabled[ON-PLSR,DRVI,DRVA]	D8137		High
M8138	Y3 speed-down time and pulse output can be change to be enabled[ON-PLSR,DRVI,DRVA]	D8138	Reserved	Low
M8139	Y4 speed-down time and pulse output can be change to be enabled[ON-PLSR,DRVI,DRVA]	D8139	Reserved	High
M8140	CLR signal output function of ZRN is enabled.	D8140	PLSY&PLSR output Y000 corresponding cumulative value for the pulse number	Low
M8141	Reserved	D8141		High
M8142	Reserved	D8142	PLSY&PLSR output Y001 corresponding cumulative value for the pulse number	Low
M8143	Reserved	D8143		High
M8144	Reserved	D8144		
M8145	Y000 pulse output stop	D8145	The offset speed when DRVI,DRVA execution	
M8146	Y001 pulse output stop	D8146	Maximum speed of DRVI,DRVA execution[Default	Low
M8147	Y000 pulse output monitor	D8147		High

			100,000]	
M8148	Y001 pulse output monitor	D8148	acceleration and deceleration time when DRVI,DRVA execution[Default 100]	
M8149	Y002 pulse output monitor	D8149	Reserved	
M8150	Y003 pulse output monitor	D8150	PLSY&PLSR output	Low
M8151	Y004 pulse output monitor	D8151	Y002 corresponding cumulative value for the pulse number	High
M8152	Y002 pulse output monitor	D8152	PLSY&PLSR output	Low
M8153	Y003 pulse output stop	D8153	Y003 corresponding cumulative value for the pulse number	High
M8154	Y004 pulse output stop	D8154	PLSY&PLSR output	Low
M8155	Reserved	D8155	Y004 corresponding cumulative value for the pulse number	High
M8156	Reserved	D8156	Clear definition of Y0 port signal (ZRN)[Default 5=Y005]	Low
M8157	Reserved	D8157	Clear definition of Y1 port signal (ZRN)[Default 6=Y006]	High
Extension function				
M8158	Reserved	D8158	Clear definition of Y2 port signal (ZRN)[Default 7=Y007]	
M8159	Reserved	D8159	Clear definition of Y3 port signal (ZRN)[Default 8=Y010]	
M8160	Selection of XCH operation to swap bytes in a single data word	D8160	Clear definition of Y4 port signal (ZRN)[Default 9=Y011]	
M8161	Selection of 8 bit operations for applied instructions ASC, RS, ASCI, HEX, CCD	D8161	Reserved	

M8162	High speed mode for parallel connection	D8162	Reserved
M8163	Reserved	D8163	Reserved
M8164	(FROM/TO) Move points variable mode	D8164	(FROM/TO) Move points fixed mode
M8165	Reserved	D8165	When the PLSR, DRVI, DR VA are in execution, the deceleration time [default 100] is determined by M8135 whether it is enabled. [Y0]
M8166	Reserved	D8166	When the PLSR, DRVI, DR VA are in execution, the deceleration time [default 100] is determined by M8136 whether it is enabled. [Y1]
M8167	(HEY)HEX data processing function	D8167	When the PLSR, DRVI, DR VA are in execution, the deceleration time [default 100] is determined by M8137 whether it is enabled. [Y2]
M8168	(SMOV)HEX data processing function	D8168	When the PLSR, DRVI, DR VA are in execution, the deceleration time [default 100] is determined by M8138 whether it is enabled. [Y3]
M8169	Reserved	D8169	When the PLSR, DRVI, DR VA are in execution, the deceleration time [default 100] is determined by M8139 whether it is enabled. [Y4]

Pulse capture		Communication link	
M8170	X000 pulse capture	D8170	Reserved
M8171	X001 pulse capture	D8171	Reserved
M8172	X002 pulse capture	D8172	Reserved
M8173	X003 pulse capture	D8173	Station No. set?status
M8174	X004 pulse capture	D8174	Communication sub-station set status
M8175	X005 pulse capture	D8175	Refresh range set status
M8176	Reserved	D8176	Station No. setting
M8177	Reserved	D8177	Communication sub-station number setting
M8178	Reserved	D8178	Refresh range setting
M8179	Reserved	D8179	Retry count setting
M8180	Reserved	D8180	Communication overtime setup
Communication link		Index addressing	
M8181	Reserved	D8181	Reserved
M8182	Reserved	D8182	Bit component address number No.2/Z1 register contents
M8183	Data transfer master station error	D8183	Bit component address number No.3/V1 register contents
M8184	Data transfer slave station 1 error	D8184	Bit component address number No.4/Z2 register contents
M8185	Data transfer slave station 2 error	D8185	Bit component address number No.5/V2 register contents
M8186	Data transfer slave station 3 error	D8186	Bit component address number No.6/Z3 register contents
M8187	Data transfer slave station 4 error	D8187	Bit component address number No.7/V3 register contents
M8188	Data transfer slave station 5 error	D8188	Bit component address number No.8/Z4 register contents
M8189	Data transfer slave station 6	D8189	Bit component address number No.9/V4 register

M8189	error	D8189	number No.9/V4 register contents
M8190	Data transfer slave station 7 error	D8190	Bit component address number No.10/Z5 register contents
M8191	Data transferring	D8191	Bit component address number No.11/V5 register contents
M8192	Reserved	D8192	Bit component address number No.12/Z6 register contents
M8193	Reserved	D8193	Bit component address number No.13/V6 register contents
M8194	Reserved	D8194	Bit component address number No.14/Z7 register content
M8195	C251 Double-frequency	D8195	Bit component address number No.15/V7 register content
M8196	C252 Double-frequency	D8196	Reserved
M8197	C253 Double-frequency	D8197	Reserved
M8198	C254 Double-frequency	D8198	Reserved
M8199	C255 Double-frequency	D8199	Reserved
Up/down counter control and status		Communication link	
M8200	C200 control	D8200	Register C251 double frequency function,while value of D8200 is different value,it stand for different double frequency,which 0:1 double frequency;0:2 double frequency;2:4 double frequency,and pls note:cannot use HSCS,HSCR,HSCZ and double frequency at the same time and only V311 and higher version can support double

			frequency function.
M8201	C201 control	D8201	Reserved
M8202	C202 control	D8202	Reserved
M8203	C203 control	D8203	Reserved
M8204	C204 control	D8204	Reserved
M8205	C205 control	D8205	Reserved
M8206	C206 control	D8206	Reserved
M8207	C207 control	D8207	Reserved
M8208	C208 control	D8208	Reserved
M8209	C209 control	D8209	Reserved
M8210	C210 control	D8210	Reserved
M8211	C211 control	D8211	Reserved
M8212	C212 control	D8212	Reserved
M8213	C213 control	D8213	Reserved
M8214	C214 control	D8214	Reserved
M8215	C215 control	D8215	Reserved
M8216	C216 control	D8216	Reserved
M8217	C217 control	D8217	Reserved
M8218	C218 control	D8218	Reserved
M8219	C219 control	D8219	Reserved
M8220	C220 control	D8220	Reserved
M8221	C221 control	D8221	Reserved
M8222	C222 control	D8222	Reserved
M8223	C223 control	D8223	Reserved
M8224	C224 control	D8224	Reserved
M8225	C225 control	D8225	Reserved
M8226	C226 control	D8226	Reserved
M8227	C227 control	D8227	Reserved
M8228	C228 control	D8228	Reserved
M8229	C229 control	D8229	Reserved
M8230	C230 control	D8230	Reserved
M8231	C231 control	D8231	Reserved
M8232	C232 control	D8232	Reserved
M8233	C233 control	D8233	Reserved
M8234	C234 control	D8234	Reserved
M8235	C235 control	D8235	Reserved
M8236	C236 control	D8236	Reserved
M8237	C237 control	D8237	Reserved
M8238	C238 control	D8238	Reserved

M8239	C239 control	D8239	Reserved
M8240	C240 control	D8240	Reserved
M8241	C241 control	D8241	Reserved
M8242	C242 control	D8242	Reserved
M8243	C243 control	D8243	Reserved
M8244	C244 control	D8244	Reserved
M8245	C245 control	D8245	Reserved
M8246	C246 control	D8246	Reserved
M8247	C247 control	D8247	Reserved
M8248	C248 control	D8248	Reserved
M8249	C249 control	D8249	Reserved
M8250	C250 control	D8250	Reserved
M8251	C251 control	D8251	Reserved
M8252	C252 control	D8252	Reserved
M8253	C253 control	D8253	Reserved
M8254	C254 control	D8254	Reserved
M8255	C255 control	D8255	Reserved

Basic Instruction

Instruction Type	Instruction	Function Description
Basic Instruction	LD	Initial logical operation contact type NO (normally open)
	LDI	Initial logical operation contact type NC (normally closed)
	OUT	Coil drive
	AND	Serial connection of NO (normally open) contacts
	ANI	Serial connection of NC (normally closed) contacts
	OR	Parallel connection of NO (normally open) contacts
	ORI	Parallel connection of NC (normally closed) contacts
	LDP	Initial logical operation - Rising edge pulse
	LDF	Initial logical operation - Falling edge pulse
	ANDP	Serial connection of Rising edge pulse
	ANDF	Serial connection of Falling edge pulse
	ORP	Parallel connection of Rising edge pulse
	ORF	Parallel connection of Falling edge pulse

	ORB	Parallel connection of multiple contact circuits
	ANB	Serial connection of multiple parallel circuits
	MPS	Stores the current result of the internal PLC operations
	MRD	Reads the current result of the internal PLC operations
	MPP	Recalls and removes the currently stored result
	MC	Start of a master control block
	MCR	End of a master control block
	INV	Inverts the current result of the internal PLC operations
	PLS	Rising edge pulse
	PLF	Falling edge pulse
	SET	Coil set
	RST	Coil reset

Step ladder instruction

Instruction Type	Instruction	Function Description
Step ladder instruction	STL	Start of Step ladder instruction
	RET	End of Step ladder instruction

Program control instruction

Instruction Type	Instruction	Function Description
Program control instruction	CJ	Conditional jump
	CJP	Conditional jump(pulse type)
	CALL	Subroutine call
	CALLP	Subroutine call(pulse type)
	EI	Interruption permissible
	DI	Interruption forbidden
	WDT	Monitor timer
	WDTP	Monitor timer(pulse type)
	FOR	Start of loop range
	NEXT	End of loop range

Move and Compare Instruction

Instruction Type	Instruction	Function Description
	CMP	Comparison of 16-bit data
	CMPP	Comparison of 16-bit data (pulse type)
	DCMP	Comparison of 32-bit data
	DCMPP	Comparison of 32-bit data (pulse type)
	ZCP	Comparison of 16-bit zone
	ZCPP	Comparison of 16-bit zone (pulse type)
	DZCP	Comparison of 32-bit zone
	DZCPP	Comparison of 32-bit zone (pulse type)
	MOV	Move of 16-bit data
	MOVP	Move of 16-bit data (pulse type)
	DMOV	Move of 32-bit data
	DMOVP	Move of 32-bit data (pulse type)
	SMOV	Shift move
	SMOVP	Shift move (pulse type)
	CML	Compliment move of 16-bit data
	CMLP	Compliment move of 16-bit data (pulse type)

Move and Compare Instruction	DCML	Compliment move of 32-bit data
	DCMLP	Compliment move of 32-bit data (pulse type)
	BMOV	Block move
	BMOVP	Block move (pulse type)グ
	FMOV	Fill move of 16-bit data
	FMOVP	Fill move of 16-bit data (pulse type)
	DFMOV	Fill move of 32-bit data
	DFMOVP	Fill move of 32-bit data (pulse type)
	XCH	Exchange of 16-bit data
	XCHP	Exchange of 16-bit data (pulse type)
	DXCH	Exchange of 32-bit data
	DXCHP	Exchange of 32-bit data (pulse type)
	BCD	BCD exchange of 16-bit data
	BCDP	BCD exchange of 16-bit data (pulse type)
	DBCD	BCD exchange of 32-bit data
	DBCDP	BCD exchange of 32-bit data (pulse type)
	BIN	BIN exchange of 16-bit data
	BINP	BIN exchange of 16-bit data (pulse type)

	DBIN	BIN exchange of 32-bit data
	DBINP	BIN exchange of 32-bit data (pulse type)

Arithmetic Operation Instruction

Instruction Type	Instruction	Function Description
	ADD	Addition of 16 bit integers
	ADDP	Addition of 16 bit integers (pulse type)
	DADD	Addition of 32 bit integers
	DADDP	Addition of 32 bit integers (pulse type)
	SUB	Subtraction of 16 bit integers
	SUBP	Subtraction of 16 bit integers (pulse type)
	DSUB	Subtraction of 32 bit integers
	DSUBP	Subtraction of 32 bit integers
	MUL	Multiplication of 16 bit integers
	MULP	Multiplication of 16 bit integers (pulse type)
	DMUL	Multiplication of 32 bit integers
	DMULP	Multiplication of 32 bit integers (pulse type)
	DIV	Division of 16 bit integers
	DIVP	Division of 16 bit integers (pulse type)

Arithmetic Operation Instruction	DDIV	Division of 32 bit integers
	DDIVP	Division of 32 bit integers (pulse type)
	INC	Add 1 to 16 bit integer
	INCP	Add 1 to 16 bit integer (pulse type)
	DINC	Add 1 to 32 bit integer
	DINCP	Add 1 to 32 bit integer (pulse type)
	DEC	Subtract 1 from 16 bit integer
	DECP	Subtract 1 from 16 bit integer (pulse type)
	DDEC	Subtract 1 from 32 bit integer
	DDECP	Subtract 1 from 32 bit integer (pulse type)
	WAND	Logical word and
	WANDP	Logical word and (pulse type)
	DAND	Logical double word and
	DANDP	Logical double word and (pulse type)
	WOR	Logical word or
	WORP	Logical word or (pulse type)
	DOR	Logical double word or
	DORP	Logical double word or (pulse type)
	WXOR	Logical word exclusive or

	WXORP	Logical word exclusive or (pulse type)
	DXOR	Logical double word exclusive or
	DXORP	Logical double word exclusive or (pulse type)
	NEG	16 bit negation instruction
	NEGP	16 bit negation instruction (pulse type)
	DNEG	32 bit negation instruction
	DNEGP	32 bit negation instruction (pulse type)

Rotation and Shift Instruction

Instruction Type	Instruction	Function Description
Rotation and Shift Instruction	ROR	Word Rotation right
	RORP	Word Rotation right(pulse type)
	DROR	Double Word Rotation right
	DRORP	Double Word Rotation right(pulse type)
	ROL	Word Rotation left
	ROLP	Word Rotation left(pulse type)
	DROL	Double Word Rotation left
	DROLP	Double Word Rotation left(pulse type)
	RCR	Word Rotation right with carry
	RCRP	Word Rotation right with carry(pulse type)
	DRCR	Double Word Rotation right with carry
	DRCRP	Double Word Rotation right with carry(pulse type)
	RCL	Word Rotation left with carry
	RCLP	Word Rotation left with carry(pulse type)
	DRCL	Double Word Rotation left with carry
	DRCLP	Double Word Rotation left with carry(pulse type)

	SFTR	Bit shift right
	SFTRP	Bit shift right(pulse type)
	SFTL	Bit shift left
	SFTLP	Bit shift left(pulse type)
	WSFR	Word shift right
	WSFRP	Word shift right(pulse type)
	WSFL	Word shift left
	WSFLP	Word shift left(pulse type)
	SFWR	Shift register write
	SFWRP	Shift register write(pulse type)
	SFRD	Shift register read
	SFRDP	Shift register read(pulse type)

Data Operation Instruction

Instruction Type	Instruction	Function Description
Data Operation Instruction	ZRST	Zone reset
	ZRSTP	Zone reset(pulse type)
	DECO	Decode
	DECOP	Decode(pulse type)
	ENCO	Encode
	ENCOP	Encode(pulse type)
	SUM	Sum of active bits (16 bit)
	SUMP	Sum of active bits (16 bit)(pulse type)
	DSUM	Sum of active bits (32 bit)
	DSUMP	Sum of active bits (32 bit)(pulse type)
	BON	Check specified bit status (16 bit)
	BONP	Check specified bit status (16 bit)(pulse type)
	DBON	Check specified bit status (32 bit)
	DBONP	Check specified bit status (32 bit)(pulse type)
	MEAN	Mean (16 bit)
	MEANP	Mean (16 bit)(pulse type)
	DMEAN	Mean (32 bit)
	DMEANP	Mean (32 bit)(pulse type)

	ANS	Timed annunciator set
	ANR	Annunciator reset
	ANRP	Annunciator reset (pulse type)
	SQR	Square root of 16 bit integer
	SQRP	Square root of 16 bit integer (pulse type)
	DSQR	Square root of 32 bit integer
	DSQRP	Square root of 32 bit integer (pulse type)
	FLT	Integer word to binary floating point conversion
	FLTP	Integer word to binary floating point conversion(pulse type)
	DFLT	Integer double word to binary floating point conversion
	DFLTP	Integer double word to binary floating point conversion(pulse type)
	SWAP	Word swap
	SWAPP	Word swap(pulse type)
	DSWAP	Double word swap
	DSWAPP	Double word swap(pulse type)

High-speed Processing Instruction

Instruction Type	Instruction	Function Description
High-speed Processing Instruction	REF	Input/output refresh
	REFP	Input/output refresh(pulse type)
	REFF	Filter adjust
	REFFP	Filter adjust(pulse type)
	MTR	Filter adjust
	DHSCR	High speed counter reset
	DHSCS	High speed counter set
	DHSZ	High speed zone compare
	SPD	Speed detection
	PLSY	16 bit pulse output
	DPLSY	32 bit pulse output
	PWM	PWM(pulse width modulation)
	PLSR	16 bit ramp pulse output
	DPLSR	32 bit ramp pulse output

Handy Instruction

Instruction Type	Instruction	Function Description
Handy Instruction	IST	Initial state
	SER	Search a 16-bit data
	SERP	Search a 16-bit data(pulse type)
	DSER	Search a 32-bit data
	DSERP	Search a 32-bit data(pulse type)
	ABSD	Absolute drum sequencer (16 bit)
	DABSD	Absolute drum sequencer (32 bit)
	INCD	Incremental drum sequencer (16 bit)
	TTMR	Teaching timer
	STMR	Special timer
	ALT	Alternate state
	ALTP	Alternate state(pulse type)
	RAMP	Ramp variable value
	ROTC	Rotary table control
	SORT	Sort tabulated data

External IO Instruction

Instruction Type	Instruction	Function Description
External IO Instruction	TKY	Ten key input
	DTKY	Ten key input (32 bit operation)
	HKY	Hexadecimal key input
	DHKY	Hexadecimal key inputク32 bit operationグ
	DSW	Digital switch
	SEGD	Seven segment decoder
	SEGDP	Seven segment decoderクpulse typeグ
	SEGL	Seven segment with latch
	ARWS	Arrow switch
	ASC	ASCII code conversio
	PR	Print ASCII code
	FROM	Read 16-bit data from buffer memories of special function block
	FROMP	Read 16-bit data from buffer memories of special function block(pulse type)
	DFROM	Read 32-bit data from buffer memories of special function block
	DFROMP	Read 32-bit data from buffer memories of special function block(pulse type)
	TO	Write 16-bit data to buffer memories of special function block
	TOP	Write 16-bit data to buffer memories of

	TOP	special function block(pulse type)
	DTO	Write 32-bit data to buffer memories of special function block
	DTOP	Write 32-bit data to buffer memories of special function block(pulse type)

External SER Device Instruction

Instruction Type	Instruction	Function Description
External SER Device Instruction	RS	Serial communication instruction
	PRUN	16 bit octal bit transmission
	PRUNP	16 bit octal bit transmission(pulse type)
	DPRUN	32 bit octal bit transmission
	DPRUNP	32 bit octal bit transmission(pulse type)
	ASCI	Convert HEX data to ASCII
	ASCIP	Convert HEX data to ASCII(pulse type)
	HEX	Convert ASCII data to HEX
	HEXP	Convert ASCII data to HEX(pulse type)
	CCD	Check parity code
	CCDP	Check parity code(pulse type)
	PID	PID control loop

Floating point operation instruction

Instruction Type	Instruction	Function Description
Floating point operation instruction	DECMP	Binary floating point data compare
	DECMPP	Binary floating point data compare(pulse type)
	DEZCP	Binary floating point zone compare
	DEZCPP	Binary floating point zone compare(pulse type)
	DEBCD	Binary to BCD floating point data conversion
	DEBCDP	Binary to BCD floating point data conversion(pulse type)
	DEBIN	BCD to Binary floating point data conversion
	DEBINP	BCD to Binary floating point data conversion(pulse type)
	DEADD	Binary floating point addition
	DEADDP	Binary floating point addition(pulse type)
	DESUB	Binary floating point subtraction
	DESUBP	Binary floating point subtraction(pulse type)
	DEMUL	Binary floating point multiplication
	DEMULP	Binary floating point multiplication(pulse type)
	DEDIV	Binary floating point division
	DEDIVP	Binary floating point division(pulse type)

	DESQR	Binary floating point square root
	DESQRP	Binary floating point square root(pulse type)
	INT	16-bit binary floating point to integer
	INTP	16-bit binary floating point to integer(pulse type)
	DINT	32-bit binary floating point to integer
	DINTP	32-bit binary floating point to integer(pulse type)
	DSIN	Floating point Sin operation
	DSINP	Floating point Sin operation(pulse type)
	DCOS	Floating point Cosine operation
	DCOSP	Floating point Cosine operation(pulse type)
	DTAN	Floating point Tangent operation
	DTANP	Floating point Tangent operation(pulse type)

Positioning Instruction

Instruction Type	Instruction	Function Description
Positioning Instruction	DABS	Absolute current value read
	ZRN	Setting of zero return speed (16 bit)
	PLSV	Variable speed pulse output (16 bit)
	DRVI	Relative position control (16 bit)
	DRVA	Absolute position control (16 bit)

Clock Control Instruction

Instruction Type	Instruction	Function Description
Clock Control Instruction	TCMP	Time compare
	TCMPP	Time compare(pulse type)
	TZCP	Time zone compare
	TZCPP	Time zone compare(pulse type)
	TADD	Time addition
	TADDP	Time addition(pulse type)
	TSUB	Time subtraction
	TSUBP	Time subtraction(pulse type)
	TRD	Time read
	TRDP	Time read(pulse type)
	TWR	Time write
	TWRP	Time write(pulse type)
	HOUR	16 bit stopwatch
	DHOUR	32 bit stopwatch

External Device Instruction

Instruction Type	Instruction	Function Description
External Device Instruction	GRY	16-bit Gray code conversion
	GRYP	16-bit Gray code conversion(pulse type)
	DGRY	32-bit Gray code conversion
	DGRYP	32-bit Gray code conversion(pulse type)
	GBIN	16-bit Gray code inverted conversion
	GBINP	16-bit Gray code inverted conversion(pulse type)
	DGBIN	32-bit Gray code inverted conversion
	DGBINP	32-bit Gray code inverted conversion(pulse type)
	RD3A	Read from analogue module
	RD3AP	Read from analogue module(pulse type)
	WR3A	Write to analogue module
	WR3AP	Write to analogue module(pulse type)

Comparison Instruction

Instruction Type	Instruction	Function Description
	LD=	Comparison of 16-bit data (==)
	LDD=	Comparison of 32-bit data (==)
	LD>	Comparison of 16-bit data (>)
	LDD>	Comparison of 32-bit data (>)
	LD<	Comparison of 16-bit data (<)
	LDD<	Comparison of 32-bit data(<)
	LD<>	Comparison of 16-bit data (<>)
	LDD<>	Comparison of 32-bit data (<>)
	LD<=	Comparison of 16-bit data (<=)
	LDD<=	Comparison of 32-bit data (<=)
	LD>=	Comparison of 16-bit data (>=)
	LDD>=	Comparison of 32-bit data (>=)
	AND=	Comparison of 16-bit data (==)
	ANDD=	Comparison of 32-bit data (==)
	AND>	Comparison of 16-bit data (>)

Comparison Instruction	ANDD>	Comparison of 32-bit data (>)
	AND<	Comparison of 16-bit data (<)
	ANDD<	Comparison of 32-bit data (<)
	AND<>	Comparison of 16-bit data (<>)
	ANDD<>	Comparison of 32-bit data (<>)
	AND<=	Comparison of 16-bit data (<=)
	ANDD<=	Comparison of 32-bit data (<=)
	AND>=	Comparison of 16-bit data (>=)
	ANDD>=	Comparison of 32-bit data (>=)
	OR=	Comparison of 16-bit data (==)
	ORD=	Comparison of 32-bit data (==)
	OR>	Comparison of 16-bit data (>)
	ORD>	Comparison of 32-bit data (>)
	OR<	Comparison of 16-bit data (<)
	ORD<	Comparison of 32-bit data (<)
	OR<>	Comparison of 16-bit data (<>)
	ORD<>	Comparison of 32-bit data (<>)
	OR<=	Comparison of 16-bit data (<=)

	ORD<=	Comparison of 32-bit data (<=)
	OR>=	Comparison of 16-bit data (>=)
	ORD>=	Comparison of 32-bit data (>=)

Basic Sequential Control Command

This section defines the types of progressive sequential commands and their functions.

Instructions ANB and ORB

Instruction Description

ANB instruction has not operands and the step number of program which ANB instruction shares is 1. The operand of ORB instruction can be X, Y, S, M, T, C, and the step number of program which ORB instruction shares is 1

Multi-branch loop uses ANB instruction When it series with the previous loop, Branch starts with LD, LDI, LDP, LDF, and use the ANB instruction to series with the branch which starts with LD, LDI, LDP, LDF instructions.

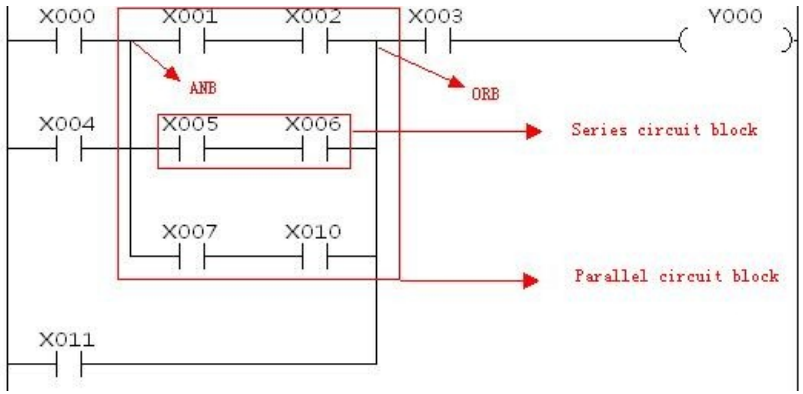
When serial circuit blocks of more than 2 contacts in series connect in parallel, every branch starts with LD and LDI instructions and ends with ORB instruction.

ANB and ORB instructions are not the instructions with the soft component.

The number of serial loop which ANB and ORB instructions uses is unlimited, but when used as approved, we must consider that the using the LD and LDI is in 8 times.

Programming Illustration:

Ladder mode:



Instruction List mode:

0	LD	X000
1	OR	X004
2	LD	X001
3	AND	X002
4	LD	X005
5	AND	X006
6	ORB	
7	LD	X007
8	AND	X010
9	ORB	
10	ANB	
11	OR	X011
12	AND	X003
13	OUT	Y000

ORB instruction is used in the end of each branch, not in the end of all branches, as command table above shown.

ORB and ANB instructions merely connect on the block. If not the block, not used. As shown, examples for series circuits block and parallel circuits block.

Instructions AND,ADNI,ANDP,ANDF

Instruction Description

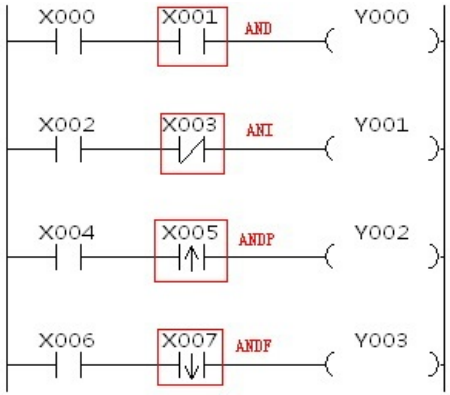
The steps of AND and ANI is 1, the steps of ANDP and ANDF is 2. The operands of these 4 instructions can be X, Y, S, M, T, C.

The instructions of AND, ADNI, ANDP and ANDF only contact one contact point. Two or more parallel circuits use ANB instruction when they are in series. The times in series is unlimited.

When ANDP and ANDF instructions is in the rising edge (when component change from the ON to OFF) and falling edge (when soft component change from the OFF to ON) contacts be connected for one cycle.

Programming Illustration:

Ladder mode:



Instruction List mode:

```
0     LD      X000
1     AND     X001
2     OUT     Y000
3     LD      X002
4     ANI     X003
5     OUT     Y001
6     LD      X004
7     ANDP    X005
9     OUT     Y002
10    LD      X006
11    ANDF    X007
13    OUT     Y003
```

- In the above example, X0, X3, Y1 are as contacts in series and conect with the front contact.

Instructions LD,LDI,LDF,LDP,OUT

Instruction Description:

LD, LDI takes 1 process step. LDP┻LDF takes 2 process steps. The operands of these 4 instructions can be X, Y, S, M, T, C.

The operand of OUT can be Y┻S┻T┻M┻or C .Soft component Y and the general M takes 1 process step. S and special auxiliary relay M take 2 process steps. Timer T takes 3 process steps. Counter takes 3-5 process steps.

LD┻LDI┻LDP┻LDF makes the contact connected to bus bar. It is also used when Multiple branches with ANB, ORB.

LDP is connected for a cycle at the time of rising edge(Soft component changes from OFF to ON).LDF is connected for a cycle at the time of falling edge(Soft component changes from ON to OFF).

LD, LDI, LDP, LDF repeats less than 8 times. It means Maximum number of series and parallel connection is 8 when it is used with ANB┻ORB behind.

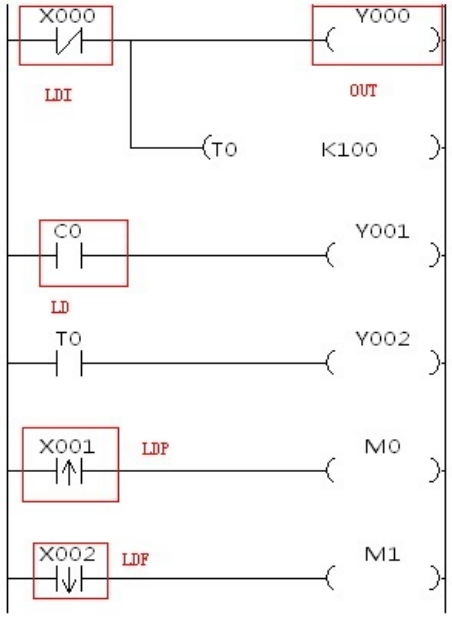
Soft component Y and the general M takes 1 process step. S and special auxiliary relay M take 2 process steps. Timer T takes 3 process steps. Counter C takes 3-5 process steps.

OUT drives Soft component coil except for Input Relay. OUT can be used continuously when used side by side.

When OUT drives counter and the front coil changes from ON to OFF or from OFF to ON ⊐ the counter increase 1.

Programming Illustration:

Ladder mode:



Instruction List mode:

0	LDI	X000	
1	OUT	Y000	
2	OUT	T0	K100
5	LD	C0	
6	OUT	Y001	
7	LD	T0	
8	OUT	Y002	
9	LDP	X001	
11	OUT	M0	
12	LDF	X002	
14	OUT	M1	

Use LD, LDI, LDP, LDF to connect with bus. Use OUT drives output coil.

When using OUT drives timing coil of timer or timing coil of counter, it is no need to set the time value and count value. It can be a constant K, or indirectly set by the register .

Instructions OR,ORI,ORP,ORF

Instruction Description

The steps of OR and ORI is 1, the steps of ORP and ORF is 2. The operands of these 4 instructions can be X, Y, S, M, T, C.

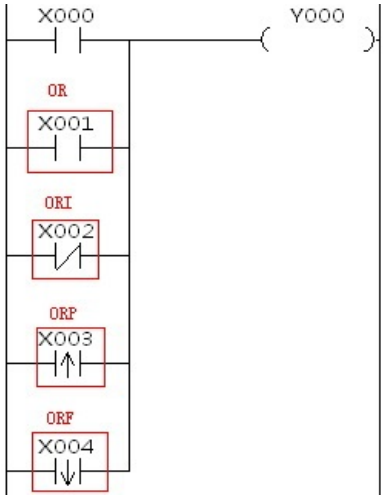
The instructions of OR, ORI, ORP and ORF only contact one points. Two or more series circuits use ORB instruction when they connect in parallel.

When ORP and ORF instructions is in the rising edge (when components change from the OFF to ON) and falling (when soft parts change from the ON to OFF), a cycle is connected.

When OR, ORI, ORP, ORF instructions and LD, LDI, LDP, LDF instructions are used together, the number of times in parallel is unlimited.

Programming Illustration:

Ladder mode:



Instruction List mode:

0	LD	X000
1	OR	X001
2	ORI	X002
3	ORP	X003
5	ORF	X004
7	OUT	Y000

Use OR, ORI, ORP, ORF to connect with LD, LDI, LDP, LDF in parallel, the program has two parallel circuit blocks in series, so use the ANB instruction. The later chapters of the instructions introduce ANB instruction.

Instructions PLS,PLF

Instruction Description

The steps of program which PLS and PLF share are 1, and operands can be Y and M (except for special M).

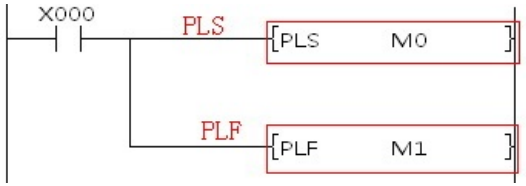
When using PLS instruction, driving software components in a scanning period when the coil changes from ON to OFF.

When using PLS instruction, driving software components in a scanning period when the coil changes from OFF to ON.

The components which have the function of latched generates run-time action when it runs the first time.

Programming Illustration:

Ladder mode:



Instruction List mode:

```
0    LD     X000
1    PLS    M0
3    PLF    M1
```

Instructions SET,RST

Instruction Description

The operands of SET instruction are Y, M, S; RST operands are X, Y, S, M, T, C, D, V, Z.

The steps of SET and RST instructions are determined by the following rules:

The procedure step of Soft component Y and the general M is 1,the program step of ?S and special auxiliary relay M, timer T, counter C is 2, the program step of data register D and variable access to sites both V and Z is 3.

SET command set the soft component when the coil is connected, as long as the set position, unless reset the soft component with RST instruction, it will remain 1 as a state. Similarly, the RST instructions reset the soft component, and it will remain 0 as a state, unless using the SET command to set.

For the same soft component, SET and RST commands can be used multiple times and random order.

RST command can make data register D, index register V, Z, timer T, the counter C to reset and be zero, either maintained or non-maintained devices.

Programming Illustration:

Ladder mode:

Instruction List mode:

0	LD	X000
1	SET	Y000
2	LDI	X001
3	RST	Y000

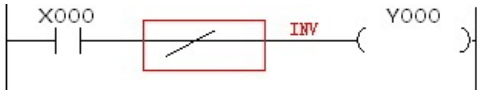
Instruction INV

Instruction Description

INV is the instruction which reverse the results before INV instruction and after LD, LDI, LDP, LDF instructions. And it has not operands. The instruction spend 1 process step.

Programming Illustration:

Ladder mode:



Instruction List mode:

```
0    LD      X000
1    INV
2    OUT     Y000
```

Instruction MC,MCR

Instruction Description:

The program step of MC instruction is 3 and the operands are Y, M (except for special M). The program step of MCR instruction is 2 and the operands are Y, M (except for special M).

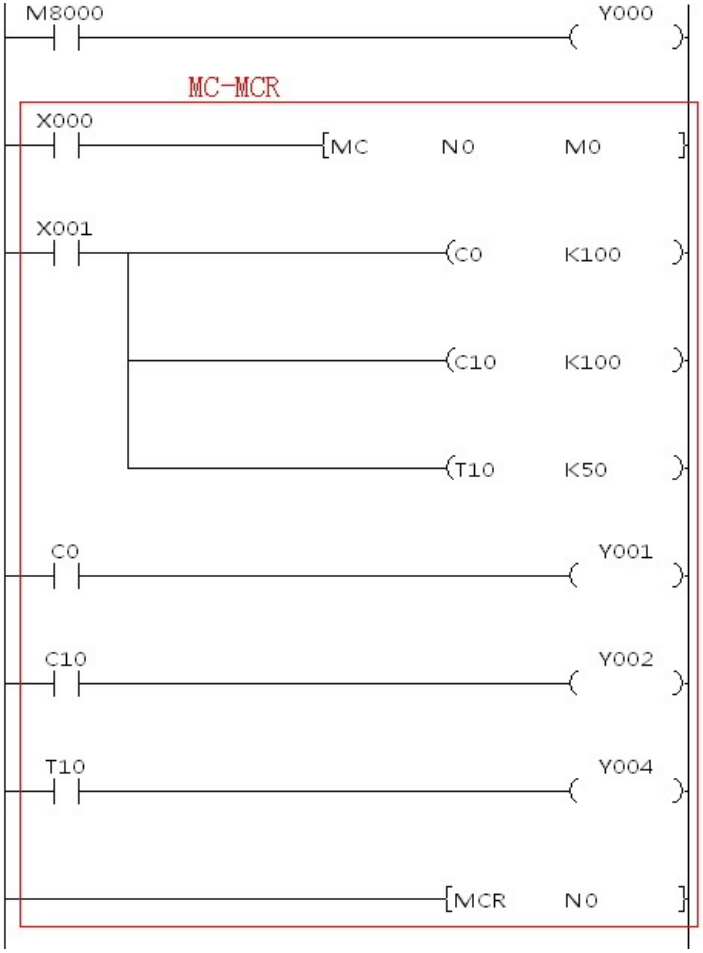
When previous contacts is connected, implement the MC and MCR instructions. when implementing the MC instruction, bus bar moves to MC contact, implement MCR instructions and return to bus bar.

When using MC instruction, the number K of the nested class increases by order, that is only the K0, to nesting K1. Instead, when using MCR instruction, it must return bus bar from large to small. Maximum nesting level is 7 (K6).

MC instruction can be used multiple times through different software components Y, M. If you use the same components, the same with the OUT instruction, there will be dual-coil output.

Programming Illustration:

Ladder mode:



Instruction List mode:

```
0     LD      M8000
1     OUT     Y000
2     LD      X000
3     MC      N0      M0
6     LD      X001
7     OUT     C0      K100
10    OUT     C10     K100
13    OUT     T10     K50
16    LD      C0
17    OUT     Y001
18    LD      C10
19    OUT     Y002
20    LD      T10
21    OUT     Y004
22    MCR     N0
```

This example only uses the MC, MCR instruction, the nested series is 1, 7 can be nested.

In this example, when X0 connected, MC and MCR instruction is implemented. When X0 is disconnected, two status as the following:

1) maintain the status : the value of the cumulative timer or counter value, use the SET / RST instruction to drive software components.

2) change into disconnected components : the value of the non-cumulative timer, use OUT instruction to drive software components.

Instruction MPS,MRD and MPP

Instruction Description

Instruction MPS,MRD and MPP have no operand, the share of program steps of all of these three instructions is one step.

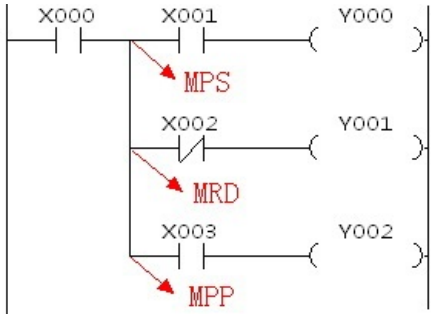
There are 11 stacks in the embedded PLC, that means the maximum depth of stacking is 11. Used once every instruction MPS, the current results are pressed into the first stack and stored, the results pressed previously moved to the next stack in turn. Instruction MPP read the first stack and delete it, the following unit move forward in turn at the same time.Instruction MRD read the first stack ,but it do not delete it. The other units remain unchanged. Using the three instructions can make multi-branch convenient.

When carrying out multi-branch program, instruction MPS saves the previous results, so that the branch behind can use instruction MRD and MPP to get the previous results in the stack and do the follow-up calculation. The last branch must use instruction MPP to make sure that the frequency of use of MPS and MPP is the same. Pay attention, after using MPP, you can't use MRD to read the result of calculation, that means MPP must be used in the last branch.

Instruction MRD can be used many times, there is no limit. The maximum number of continuous use of MPS is 11, but it can be used multiple times. Every instruction MPS has its corresponding instruction MPP, the number of MPP can't be more than that of MPS.

Programming Illustration:

Ladder Diagram (Illustration 1):

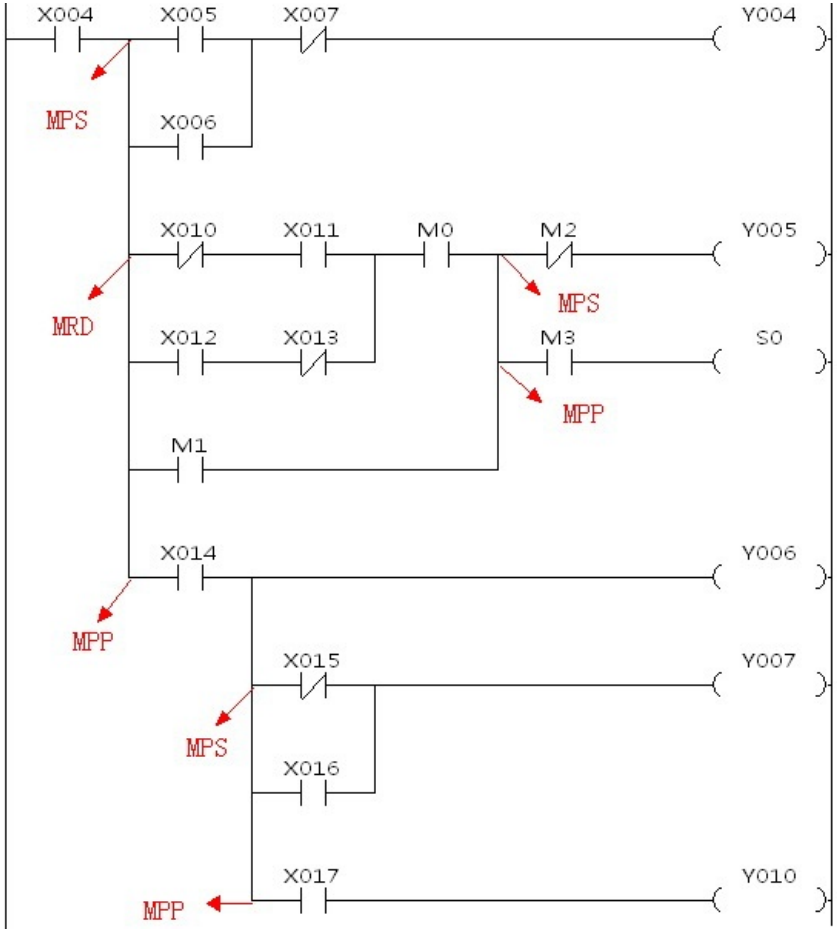


Instruction list mode(Example 1):

0	LD	X000
1	MPS	
2	AND	X001
3	OUT	Y000
4	MRD	
5	ANI	X002
6	OUT	Y001
7	MPP	
8	AND	X003
9	OUT	Y002

Example 1 uses only one stack, uses an instruction of MPS to press stack, an instruction of MRD to read stack and an instruction of MPP to get out of the stack.

Ladder Diagram (Illustration 2):



Instruction list mode(Example 2):

```
0     LD      X004
1     MPS
2     LD      X005
3     OR      X006
4     ANB
5     ANI     X007
6     OUT     Y004
7     MRD
8     LDI     X010
9     AND     X011
10    LD      X012
11    ANI     X013
12    ORB
13    ANB
14    AND     M0
15    OR      M1
16    MPS
17    ANI     M2
18    OUT     Y005
19    MPP
20    AND     M3
21    OUT     S0
23    MPP
24    AND     X014
25    OUT     Y006
26    MPS
27    LDI     X015
28    OR      X016
29    ANB
30    OUT     Y007
31    MPP
32    AND     X017
33    OUT     Y010
```

- Example 2 uses one level two stack, and uses it mixed with the struction of OR, ORB and ANB.

Commands & Functions

In this section the features and functions of application commands are described in detail; Commands that have the same functions (16-bit, 32-bit, progressive execution, and pulse commands types) will be described together.

ABSD instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ABSD	BIN addtion operation	16	No	ABSD (S1) (S2) (D) (n)	9
DABSD		32	No		17

This instruction does a multi-section comparison, which is used for realizing cam control. The table and counter for comparison are all set in absolute mode. The instruction is implemented in the scanning main program, and the comparison result is affected by scan time delay. Where:

(S1) is the starting component address of the comparison table.

(S2) is the counter component serial number. When using 32 bit instruction, it could be used as a 32 bit counter.

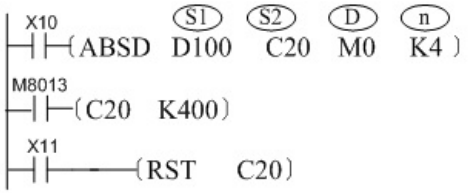
(D) is the starting address of the comparison result, occupying (n) several continuous bit variable units.

(n) is the number of multi-segment comparison data.

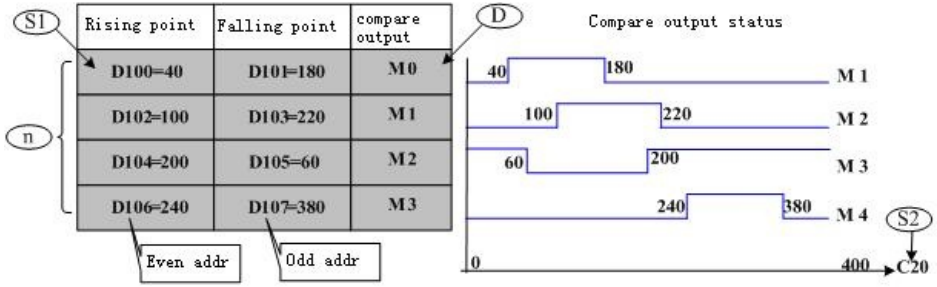
When using 32 bit instruction, (S1) (S2) (D) are all pointing to 32bit variable, and (n) is also calculated according to 32bit variable width.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)							✔	✔	✔	✔	✔	✔	✔		
(S2)												✔			
(D)				✔											
(n)	Constant,n ツ 1~64;														
When (S1) operands are KnX┴KnY┴KnM┴KnS , if it is 16bit instruction, K4 must be specified; if it is 32bit instruction, K8 must be specified and the component number of X,Y,M,S must be a multiple of 8. (S1) operand can only specify C0 to C199 with 16bit instruction, and specify C200 to C254 with 32bit instruction.															

Programming example



If the relevant variables have been set as follows, when X10=ON, the implementation result is shown in the following figure.



Instruction for use:

Before ABSD instruction is implemented, all the variables in the form should be assigned with a MOV instruction.

- Even if the DABSD instruction is applied with high-speed instruction, the comparison result (D) is also affected by user program scan time delay. For the application with time response requirement, the HSZ high-speed comparison instruction is recommended.

ADD instruction

Instruction Description:

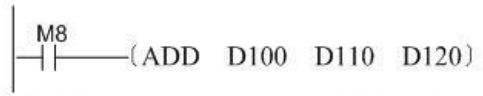
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ADD	BIN addtion operation	16	No	ADD (S1) (S2) (D)	7
ADDP		16	Yes		7
DADD		32	No		13
DADDP		32	Yes		13

This instruction is driven by contact with three operation variables. (S1) and (S2) are added in BIN algebra and saved in (D). The involved variables are handled as a signed number, whose highest digit is a sign bit. 0 is positive number, and 1 is negative.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

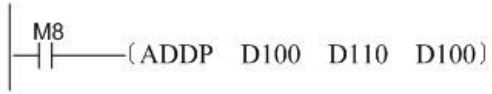
Programming example

Example 1 for instruction:



If M8 is set, add the content of D100 and D110 and save it to D120. For example, if D100=K8, D110=K-12, then D120=8+(-12) =k-4.

Example 2 for instruction:



If M8 is set, add the content of summand D100 and addend D110 and save it to summand D100.

Instruction for use

If the calculation result is 0, the 0 flag bit (M8020) will be reset.

- When the calculation result exceeds 32,767 (16bit calculation) or 2,147,483,647 (32bit calculation), the carry flag bit (M8021) will be reset.
- When the calculation result does not exceed -32,768 (16bit calculation) or -2,147,483,648 (32bit calculation), the carry flag bit (M8022) will be reset.
- When using 32bit calculation, the instruction variable address is a low 16bit address, and the adjoining address is a high 16bit address. It should be prevented from repeating or overwriting in the programming.

ALT instruction

Instruction Description

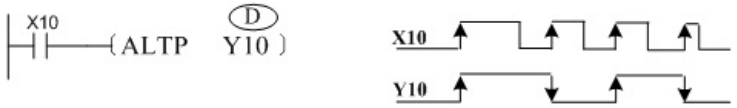
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ALT	Output alternatively	16	No	ATL (D)	3
ALTP		16	Yes		3

This instruction reverses (D) component state when the power flow is effective. (D) is bit variable component. Usually, the pulse operation type is preferred.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)		✔	✔	✔											

Programming example

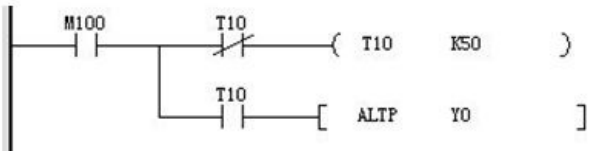
Example 1 for instruction:



The following instruction operation is the same:

Example 2 for instruction:

If the timer is introduced in the instruction power flow, it is easy to implement oscillator output (the function can also be implemented by using a special timer STMR instruction), which is shown in the following figure:

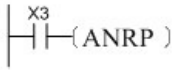


ANR instruction

Instruction Description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ANR	Signal alarm reset	16	No	ANR(without operand)	1
ANRP		16	Yes		1

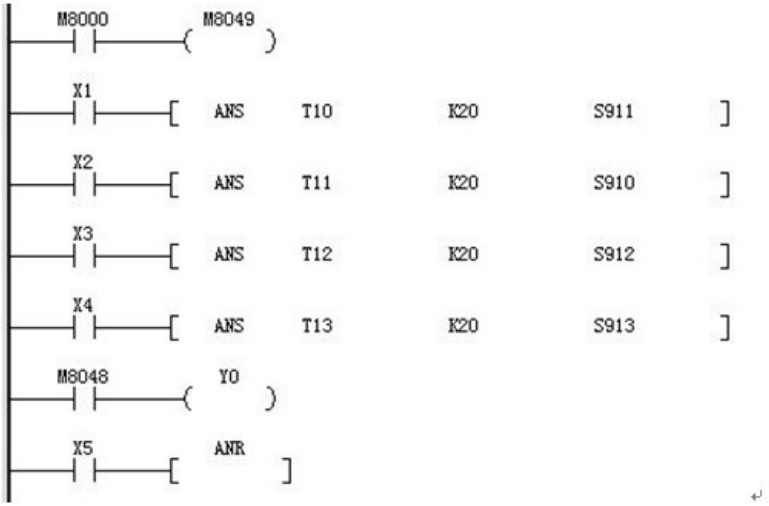
The ideal instruction is for a driver signal alarm. For example:



If X3 is connected, the alarm point with operation state in signal alarm S900~S999 is reset. If multiple alarm points are operating simultaneously, the alarm point with the lowest number is reset to ON.

If X3 is re-connected, the following number state is reset. Actually, ANRP instruction is preferred.

Programming example:



When M8049 is ON and any one bit in the range S900~S999 is ON, M8049 is set to ON, and Y0 signals the alarm.

If the program has S910, S911, S912, S913 all set to ON and X5 is switched from OFF to ON for the first time, S910 is reset.

When X5 is set to ON for the second time, S911 is simultaneously reset.

ANS instruction

Instruction Description

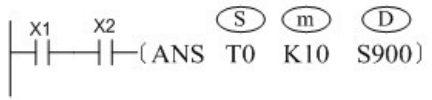
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ANS	Signal alarm setting	16	No	ANS (S) (m) (D)	7

The ideal instruction is for a driver signal alarm.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)											✔				
(D)				✔											
(m)	Constant コ m=1~32767, ク unit:100msグ.														

Where, the range of (S) is T0~T199, and the range of (D) is S900~S999.

Programming example:



If X1 and X2 are connected for more than 1 second, S900 is set. Following that, S900 stays in a state of operation, even if X1 or X2 is set to OFF (but T0 can be reset to 0). If X1 and X2 are connected for less than 1 second, X1 or X2 will set to OFF and the timer is reset.

If M8049 (signal alarm is available) is set to ON in advance, the lowest number with the ON state in signal alarm S900~S999 will be saved at D8049 (the lowest number with the ON state); when any signal in S900~S999 is ON then M8048 is set to ON (alarm operation).

ARWS instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ARWS	Directive switch	16	No	ARWS (S) (D1) (D2) (n)	7

The instruction specifies X as the edit key, and the Y port is a 4-digit, 7-fragment nixie tube, which is used as a simple interface for registering edited parameters, where:

(S) is the address where the specified key input begins, which occupies the following 4 bit units;

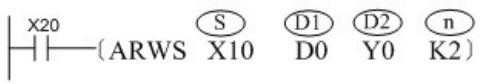
(D1) is the variable that is displayed and modified, which is used to show only a variable with a 16bit width;

(D2) is the starting address of the Y port of the nixie tube display driver, which occupies the following 8 Y ports.

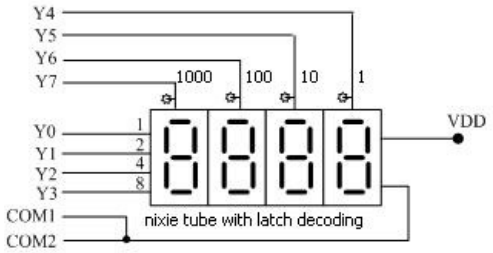
(n) is the value set for the logic signal, which refers to the (n) corresponding detailed description in the SEGL instructions above.

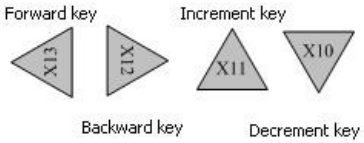
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔	✔											
(D1)											✔	✔	✔	✔	✔
(D2)		✔													
(n)	Constant,n为0~3														

Programming example



The corresponding hardware wiring is shown in the following figure, in which PLC is the transistor output type:





Operation method:

(1)The nixie tube shows a figure value of D0. Press X10~X13 to modify the value, which should be within the 0~9999 range.

(2)When the X20 is ON, the cursor digit is shown as kilobits. Each time the backward key (X12) is pressed, the specified bit switches in the order of "thousand→hundred→ten→thousand"; when pressing the forward key (X13), the switch order reverses; and the digit cursor is indicated by the LED which is connected with the gating pulse signal (YO04 ~YOO7グ.

(3)The cursor digit number switches in the order of 0 → 1→ 2→……8→9→0→1 when the increment key (X11) is pressed, when pressing the decrement key (X10), the number switches in the order of 0→9→8→7→…… 1→0→9,and the modified value becomes operative at once.

Instruction for use

When the scan time in the user program scan time is short, please use the constant scan mode instead, or scan in constant intervals using the interrupt timer.

ASC instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ASC	ASCII code conversion	16	No	ASC (S) (D)	11

(S) is the English letter inputted from computer, which is to be converted, and the max allowable length is 8 characters.

(D) is the starting component number used to storage ASCII code, which occupies successive 4 (M8161=0) or 8 (M8161=1) variables.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	When inputting instruction, it is inputted by a constant 8 characters in length.														
(D)											✔	✔	✔		

Programming example

The values of D200-D203 when X20=ON are shown in the left chart.

	High byte	Low byte
D200	54 (t)	53 (S)
D201	50 (p)	4F (o)
D202	45 (e)	50 (p)
D203	20	44 (d)

If the special register M8161 is set to ON, every ASCII character occupies one 16bit variable after conversion, which is shown in the following figure, and the higher byte of every variable is set to 0.

	High byte	Low byte
D200	00	53（S）
D201	00	54（t）
D202	00	4F（o）
D203	00	50（p）
D204	00	50（p）
D205	00	45（e）
D206	00	44（d）
D207	00	20

Attached: "ASCII code parallel fable"

Decimal digit	ASCII (Hex)
0	30
1	31
2	32
3	33
4	34
5	35
6	36
7	37
8	38
9	39

English letter	ASCII (Hex)	English letter	ASCII (Hex)
A	41	N	4E
B	42	O	4F
C	43	P	50
D	44	Q	51
E	45	R	52
F	46	S	53
G	47	T	54
H	48	U	55
I	49	V	56
J	4A	W	57
K	4B	X	58
L	4C	Y	59
M	4D	Z	5A

Code	ASCII (Hex)
STX	02
ETX	03

ASCI instruction

Instruction Description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ASCI	ASCII conversion	16	No	ASCI (S) (D) (n)	7
ASCIP		16	Yes		7

This instruction converts (S) value to ASCII, which is then saved in variable with start address (D), where:

(S) is the variable address, which is to be converted, or a constant value.

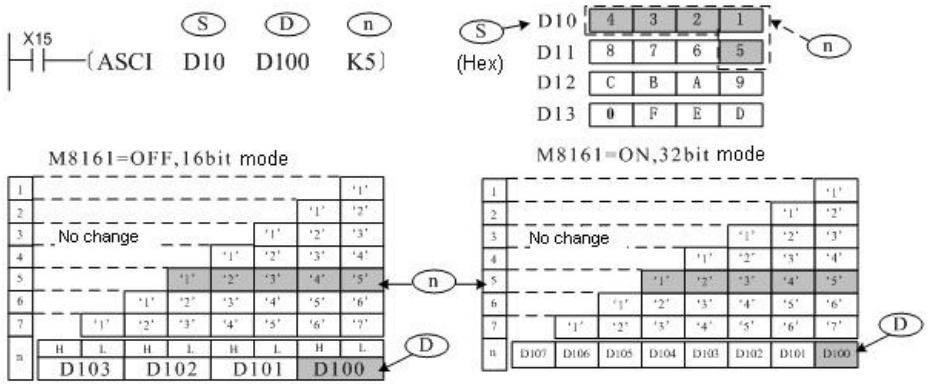
(D) is the start address for saving converted ASCII.

(n) is the converted character digit number.

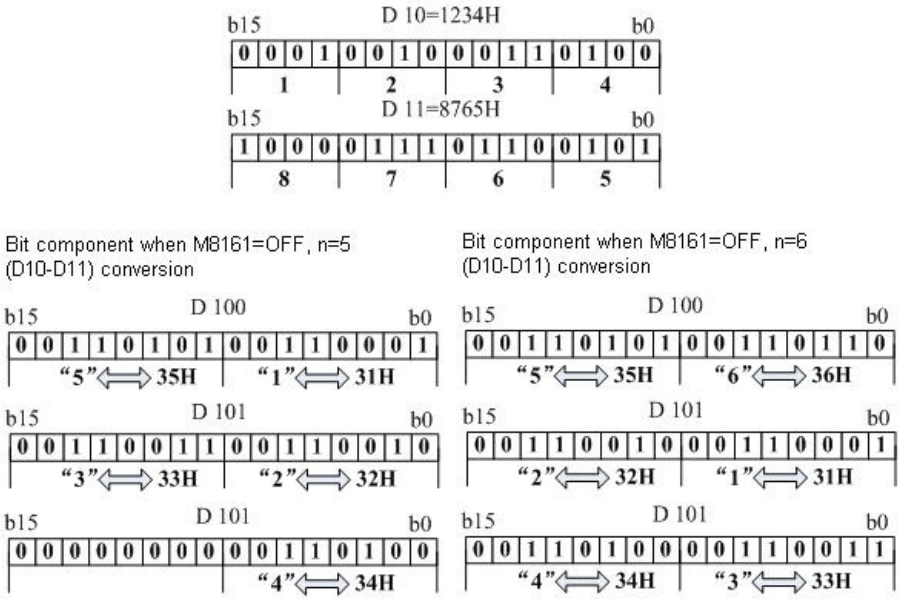
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔		
(n)	Constant, n=1~256														

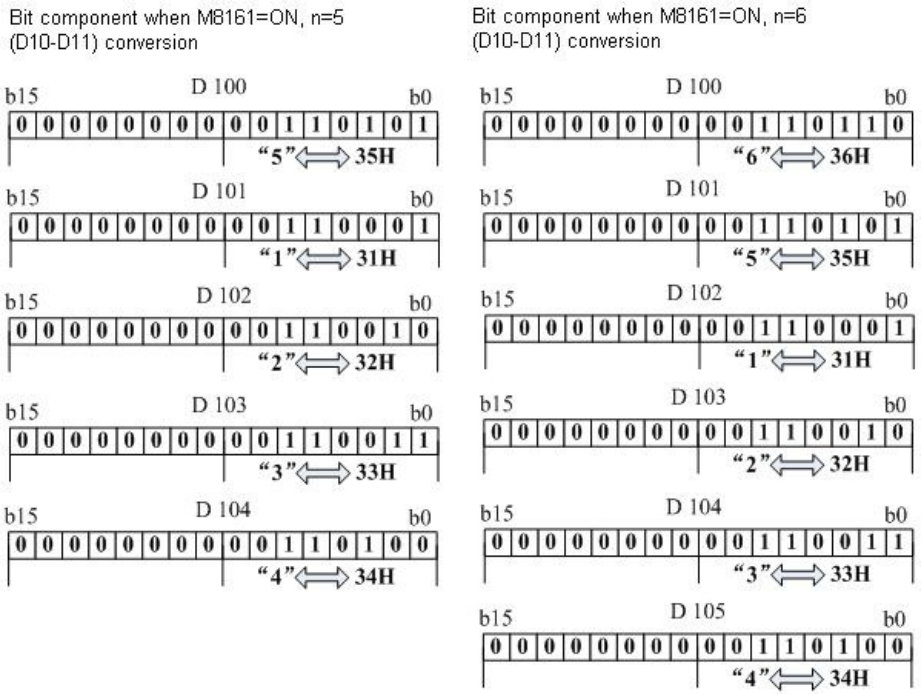
The ASCI value conversion complies with ASCII and HEX value parallel fable. For example: ASCII '0' according to HEX 'H30', ASCII 'F' according to HEX 'H46', and so on. For the contrast relationship of HEX and ASCII, please refer to the appendix following FNC76 (ASC) instruction.

Programming example



The M8161 flag determines the width mode of the target variable for calculation result storage. When M8161=OFF, it is 16bit mode, which means the higher byte and lower byte are saved respectively. When M8161=ON, it is 8bit mode, which means that only the lower byte is used to save result and the actual variable range length is longer.





Note: RS/ HEX/ ASCI/ CCD instructions share the M8161 mode flag, which should noticed when programming.

BCD instruction

Instruction Description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
BCD	The instruction is to convert source (BIN) to target (BCD).	16	No	BCD (S) (D)	5
BCDP		16	Yes		5
DBCD		32	no		9
DBCDP		32	Yes		9

The instruction is driven by contact with two operation variables. (S) (BIN) value is converted in BIN and then saved to (D). The instruction is usually used for data format processing before displaying.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)								✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

If conversion result exceeds 9999(16bit) or 99999999(32bit), there will be error.M8067, M8068 will be set to ON, and the error code will be saved in D8067.

Programming example:

The BIN value in D200 is converted to BCD value and the units of the result are saved to K1Y0 (four bit components Y0~Y3).
If D200=H000E (hex)=K14 (decimal), then Y0~Y3=0100(BIN) after conversion.
If D200= H0028 (hex)=K40 (decimal), then Y0~Y3=0000(BIN) after conversion.

BIN conversion

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
BIN	The instruction is to convert source (BCD) to target (BIN)	16	No	BIN (S) (D)	5
BINP		16	Yes		5
DBIN		32	no		9
DBINP		32	Yes		9

The instruction is driven by contact with two operation variables. (S) (BCD) value is converted into BIN and then saved to (D). The instruction is usually used to convert the data, which is read from the external port, to BIN format, which can be directly applied for calculation.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)								✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

The available range of (S) (BCD) is 16bit:0~9999;32bit:0~99,999,999

If (S) data is not in BCD format, there will be a calculation error and M8067, M8068 will be reset.

Programming Illustration:

When M8 is set, the BCD value in K1Y0 is converted to BIN and saved to D200

BMOV instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
BMOV	Transmitting n data began with an original specified soft component to the address began with specified target soft component.	16	No	BMOV (S) (D) (n)	7
BMOVP		16	Yes		7

The instruction is driven by contact with three operation variables. (n) variables with a starting address specified by (S) are transmitted into units with a starting address specified by (D).

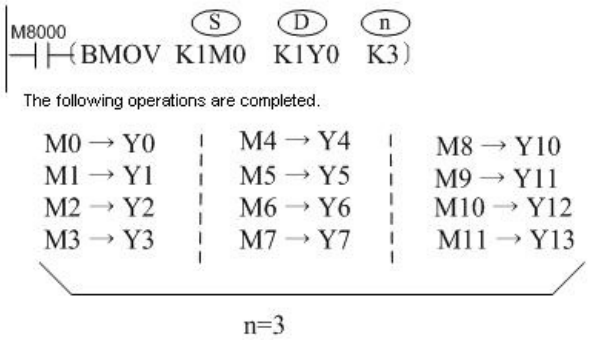
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		
(n)	Constant,nツ1~512														

Where, (n) is within the range of 1~512.

When the special variable is M8024=1, the direct transmission is opposite, which means that (n) variables with a starting address specified by (S) are transmitted into (n) units with a starting address specified by (D).

When operand is bit component, the digit number of (S) and (D) should be same.

Programming Illustration:



BON instruction

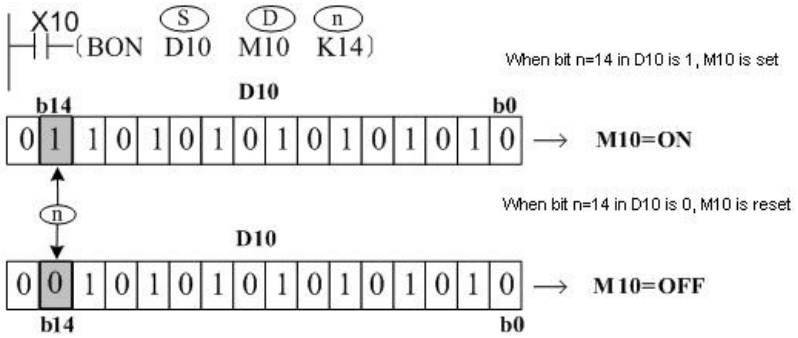
Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
BON	The instruction is to check whether the specific position is ON or OFF	16	No	BON (S) (D) (n)	7
BONP		16	Yes		7
DBON		32	no		13
DBONP		32	Yes		13

Judging the state of the No. (n) bit in (S), and saving the result to (D).

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)		✔	✔	✔											
(n)	n=0~15ク16bitグ;n=0~31ク32bitグ														

Programming Illustration:



M10 remains the previous state when X10 is changed from ON to OFF.

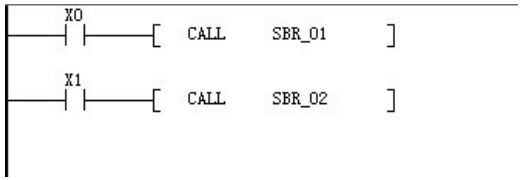
CALL instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
CALL	Subroutine call	16	No	CALL subroutine name	3
CALLP		16	Yes		3

Programming example:

main program:



- According to the above example program, if X0 is ON, CALL instruction will be carried out to jump to subroutine SBR_01. If subroutine SBR_01 is completed, it will return to the main program to run the next instruction. Similarly, if X1 is ON, it will jump to subroutine SBR_02 to run, until program ends.

At most 4 nestings are allowed in a subroutine, that's to say, the maximum number of other subroutines permitted in any subroutine is 4.

CCD instruction

Instruction description:

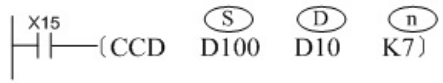
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
CCD	Checking code	16	No	CCD (S) (D) (n)	7
CCDP		16	Yes		7

This instruction checks and calculates (n) variables starting with (S), and the addition result and logical exclusive-or one-by-one result are respectively saved to (D) and (D)+1. When used for communication, the instruction is implemented to string SumCheck for the correctness of data transmission.

(S) is the starting address and the following addresses are all used for saving variables, which are to be checked and calculated. (D) and (D)+1 are respectively used to save addition result and logical exclusive-or result, and (n) is the bit number occupied by variables for checking.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		
(n)	Constant,n=1~256														

Programming Illustration:



M8161 flag determines the variable width mode. When M8161=OFF, it is 16bit mode, which means that both higher bits and lower bits are involved in calculation. When M8161=ON, it is 8bit mode, which means that only lower bits are involved in calculation and higher bits are discarded, thus the actual variable range is extended, which is shown in the following figure:

"Accumulative summation" refers to the addition calculation result of specified n variables.

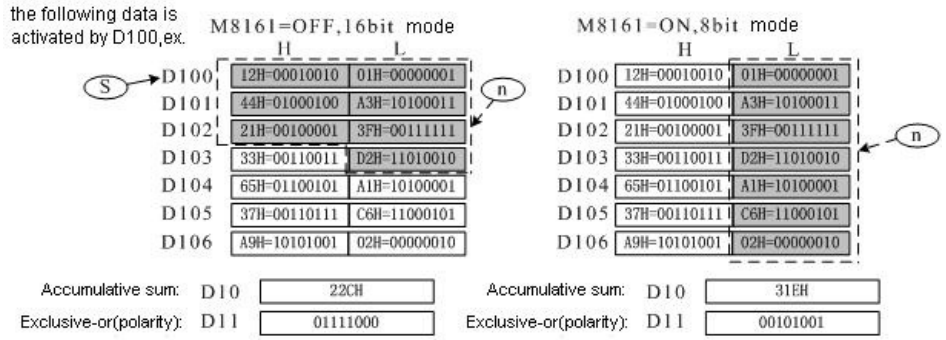
The "exclusive-or" logical calculation means:

1ゲ The involved variables are converted to binary format.

2ゲ Then it counts the number of variables with bit0=1. If it is even, the calculation result of bit0 is 0. If it is odd, the calculation result of bit0 is 1.

3ダ Then it counts the number of variables with bit1=1. If it is even, the calculation result of bit1 is 0; If it is odd, the calculation result of bit1 is 1.

4ダ In the same way, calculation is implemented from bit2 to bit7. After that, the binary HEX value converted from binary is the exclusive-or result (polarity value).



- RS/ HEX/ ASCI/ CCD instructions share the M8161 mode flag, which should be paid attention to when programming.

CJ instruction

Instruction description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
CJ	Conditional jump	16	No	CJ P0-P127	3
CJP		16	Yes		3

This instruction disables the sequence control program from CJ, CJP instruction to point (p).

It can help to decrease circle time (scan period) and implement the program applying double coil.

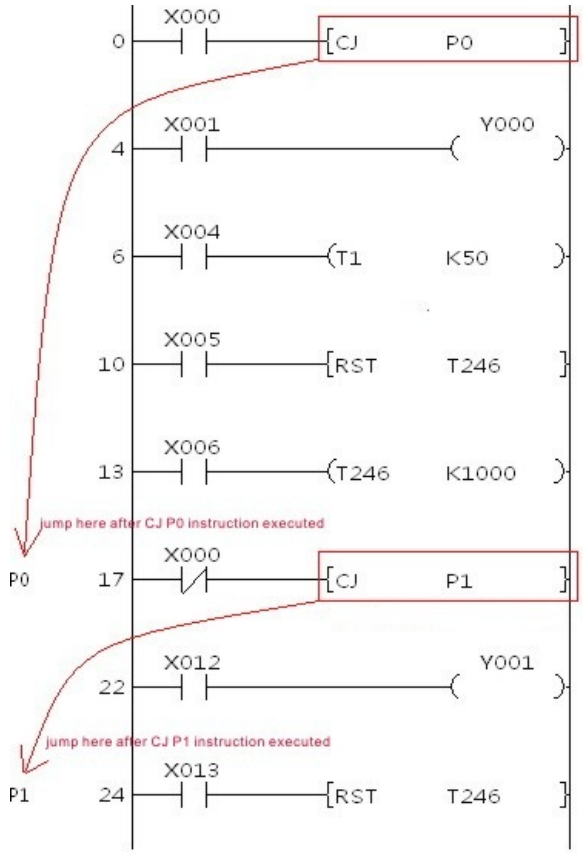
ジグWhen power flow is effective, the program will automatically jump from the CJ (or CJP) instruction address to the address specified by p*** and go on running, and the skipped instructions will not be implemented.

スグWhen power flow is ineffective, the program will go on, and the CJ (or JCP) instruction will not be implemented.

If there is a TMR timer or counter in skipped instructions which has been activated, the operation should be:

Operation condition	CJ with jump	CJ without jump
T192~T199	Operating normally	Operating normally
Other timer	Stop timing	
C235~C255	Operating normally	
Other timer	Stop counting	

Programming Illustration:



- In the above example: If X0=ON and jump instruction is implemented, the coil operations in skipped instructions are listed as follows:
- Y,M,S hold the previous operation.
- If T is not activated before jumping, the timer will not operate even it is activated after jumping. If T is activated, it will keep running but contact will not operate. When X0 is OFF, contact operates immediately.
- If C is not activated before jumping, the counter will not operate even if it is activated after jumping. If it is activated, the timer interrupts. When X0 is OFF, the timer goes on counting.
- After jumping, the function instruction will not operate.
- If the reset instruction of the timer and counter is out of the jump, the timer coil and jump counter coil reset is effective.

CML instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
CML	The instruction to transmit the data in reversion direction	16	No	CML (S) (D)	5
CMLP		16	Yes		5
DCML		32	No		13
DCMLP		32	Yes		13

The instruction is driven by contact with two operation variables. (S) (BIN) value is inverted bit by bit and then copied to (D).

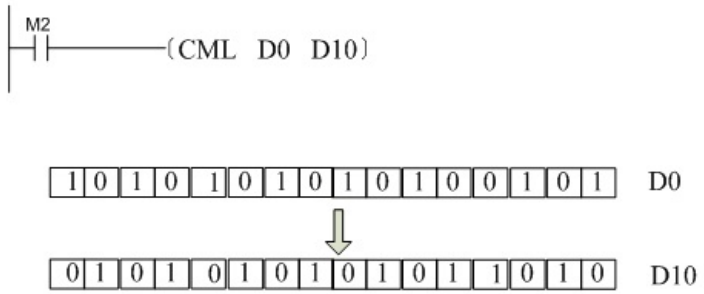
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

When (D) digit number is less than 16bit, it will result in inverting (S) and transmitting to (D) variable with low bit alignment.

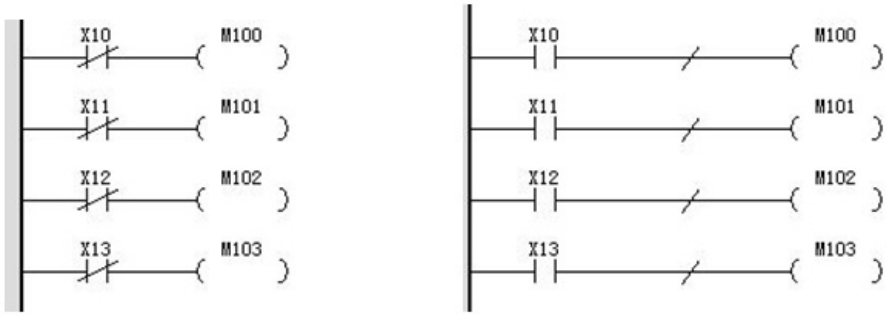
When it is 32 bit instruction (DCML), the corresponding (S) and (D) variable units in high address will be involved in calculation. Example: the calculation result for┼DCML D1 D5┼is:/D1→D5/D2→D6

Programming Illustration:

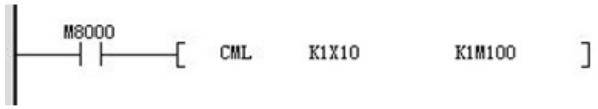
Example 1 for instruction:



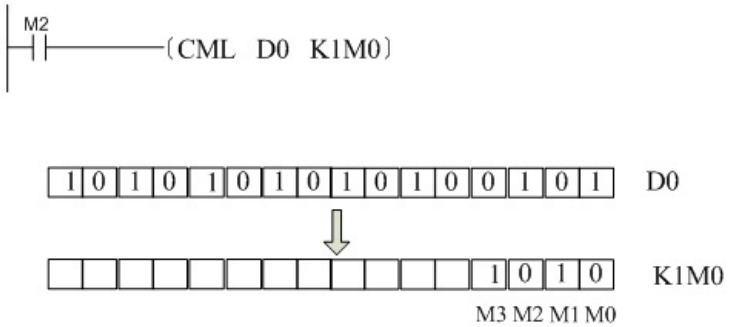
Example 2 for instruction:



The above-mentioned two programs can be implemented with the following CML instruction.



Example 3 for instruction:



CMP instruction

Instruction description:

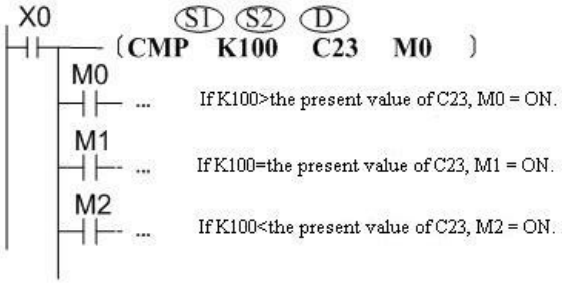
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
CMP	Comparison instruction	16	No	CMP (S1) (S2) (D)	7
CMPP		16	Yes		7
DCMP		32	No		13
DCMPP		32	Yes		13

This instruction compares two operational variables and outputs the comparison result to a specified bit variable. The operands are all algebra compared according to signed data.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)		✔	✔	✔											

(D) will occupy 3 bit variables in the continue address.

Programming Illustration:



One of M0~M2=ON if X0=ON.
CMP instruction will not be executed and M0~M2 will remain the state before X0= OFF when XO is changed from ON to OFF. RST or ZRST can be used to clear the comparison result of M0~M2.
M0~M2 can be connected in serial or parallel to obtain the result of ≧, ≦, ≠.

DABS instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DABS	Read the current ABS value	32	No	DABS (S) (D1) (D2)	13

The instruction is to read the motor absolute position (ABS) data from the servo driver via the high-speed input port.

(S) is the input signal for reading the servo device, occupying the following three units.

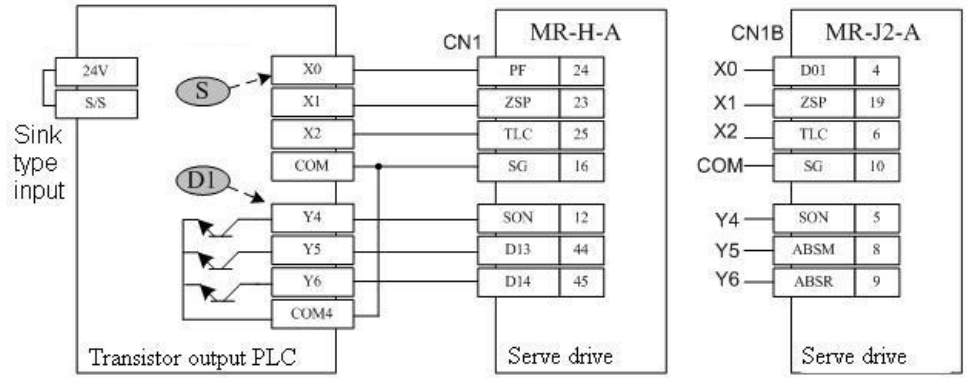
(D1) is the control signal transmitted to the servo device, occupying the following three units.

(D2) is the storage unit for the data read from servo with a 32bit width, occupying (D2)+1, (D2) unit that specifies D8140.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔	✔											
(D1)		✔	✔	✔											
(D2)								✔	✔	✔	✔	✔	✔	✔	✔

Programming Illustration:

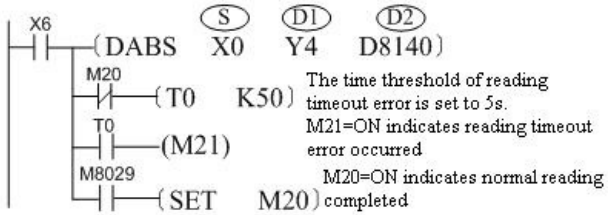
The corresponding wiring method is shown in the following figure, in which the servo driver is a Mitsubishi product equipped with an absolute position detection encoder servo motor.



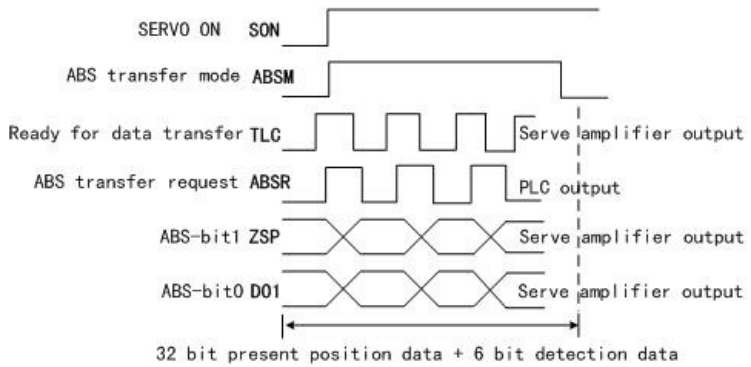
When the instruction driver M10 is set to ON, it begins to read. When this is completed, the M8029 flag is set to ON;

When the instruction implementation operation is in process and the driver flag is set to OFF, the read operation will be interrupted;

The programming example for reading ABS data is as follows: when the X6 terminal is closed, it begins to read. If it is not completed in 5s, the timeout flag M21 will be set. The code is listed as following:



The signal time sequence of the ABS read operation is shown in the following figure. When implementing an instruction, the PLC will automatically implement the access operation with servo driver.



DCOS calculation

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DCOS	Floating	32	No	DCOS (S) (D)	9
DCOSP	COS	32	Yes		9
	calculation				

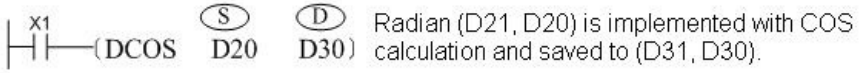
The instruction is to calculate the COS value for the specified angle (RAD, radian), in which the variables are in a binary floating format. Where:

(S) is the angle variable for the COS calculation, and the RAD unit is displayed in a binary floating point. With the available rangeof0<=α<=2π;

(D) is the storage unit for the converted COS calculation results in binary floating format.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)													✔		

Programming Illustration:



The calculated source data and COS results are all in binary floating format.

RAD(radian)value= angle×π/180°,for example, the radian corresponding toangle360°=360°×π/180°=2π.

For the program instruction for the COS calculation of an angle, please refer to examples in the SIN instruction.

DEADD instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DEADD	Binary	32	No	DEADD (S1) (S2) (D)	13
DEADDP	floating	32	Yes		13
	addition				

This instruction implements binary floating addition calculation.

(S1) and (S2) are respective binary floating addends.

(D) is the storage unit for the binary floating addition result.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔							✔		
(S2)					✔	✔							✔		
(D)													✔		

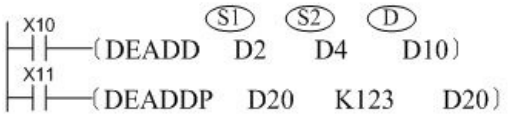
If the source operand of S1 or S2 is constant K or H, it will automatically be converted to binary floating value for addition calculation.

If the calculation result is 0, the 0 flag bit (M8020) will be reset.

If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.

If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.

Programming Illustration:



When X10=ON and binary floating variable (D3, D2) is added by binary floating variable (D5, D4), the result will be saved in (D11, D10).

When X11 is set from OFF to ON, the binary floating (D21, D20) value is added by 123. The constant K123 is automatically converted to binary floating value before calculation.

The storage unit for result could be the storage unit for addends, in which the pulse-type DEADD instruction is recommended, or the continue implementation instruction will be applied, in which the calculation will be implemented every time the program is scanned.

DEBCD instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DEBCD	Converting	32	No	DEBCD (S) (D)	9
DEBCDP	binary floating	32	Yes		9
	to decimal floating				

This instruction converts binary floating to decimal floating.

(S) is binary floating variable.

(D) is the storage unit for converted decimal floating result.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)													✔		

Programming Illustration:

The binary floating value in (D3,D2) is converted to decimal floating value and then saved to (D11,D10).
There are 23 bits real number, 8 bits exponent, and1 bit signal in binary floating [D3,D2], which will be converted to decimal floating [D11,D10], and it could be expressed with science formula of D2×10D3.

The floating data calculation in PLC is all in binary format, and it is converted to decimal for ease of monitoring.

DEBIN instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DEBIN	Converting decimal floating to binary floating	32	No	DEBIN (S) (D)	9
DEBINP		32	Yes		9

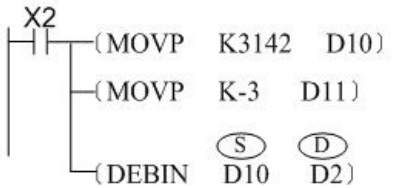
This instruction converts decimal floating to binary floating. Where:

(S) is decimal floating variable.

(D) is the storage unit for converted binary floating result.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)													✔		

Programming Illustration:



The decimal floating 3.142, which is saved in D11,D10, is converted to binary floating and then saved in (D3,D2).

DEC instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DEC	1 subtracted from BIN	16	No	DEC (D)	3
DECP		16	Yes		3
DDEC		32	No		5
DDECP		32	Yes		5

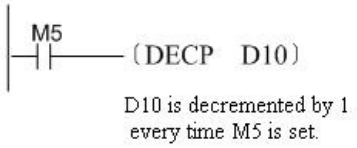
Everytime instruction be executed,subtracted 1 from (D).

When 16bit operation, -32,768 subtracts 1 to 32,767;32bit operation, -2,147,483,648 subtracts 1 to 2,147,483,647. The instruction don't refresh in sign 0,carry and borrow.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)								✔	✔	✔	✔	✔	✔	✔	✔

When executed 32bit operation, (D) variable address is low 16bit address in instruction,border upon high coding address unit is high 16bit,be careful of repeat and cover in fault when program.

Programming Illustration:



DECMP instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DECMP	Binary floating comparison	32	No	DECMP (S1) (S2) (D)	13
DECMPP		32	Yes		13

This instruction compares two floating variables and outputs the comparison result to three variables starting with (D). Where:

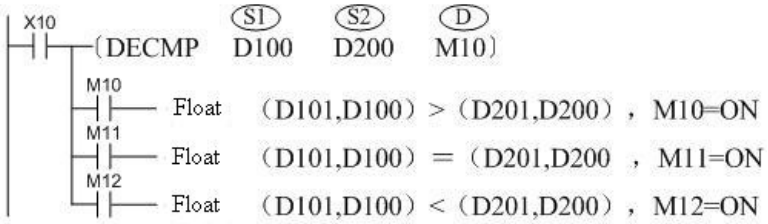
(S1) is the binary floating value 1 for comparison.

(S2) is the binary floating value 2 for comparison.

(D) is the storage unit for comparison result, occupying three variable units.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔							✔		
(S2)					✔	✔							✔		
(D)		✔	✔	✔											

Programming Illustration:



One of M10~M12 will be turned ON if X10=ON.
DECP instruction will not be executed and M10~M12 will remain the state before X0= OFF when X10 is changed from ON to OFF. RST or ZRST can be used to clear the comparison result of M10~M12.
M10~M12 can be connected in serial or parallel to obtain the result of ≧, ≦, ≠
.

If (S1) or (S2) is K, H constant, they will be automatically converted to floating for calculation.

DECO instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DECO	Code translation (to convert any one digit in data to one point with ON)	16	No	DECO (S) (D) (n)	7
DECOP		16	Yes		7

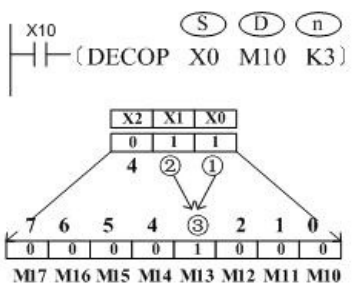
It calculates the value of (S) last (2^(n)) digit and takes it as the bit pointer. It sets the digit corresponding (D) to 1, and the other digits to 0.

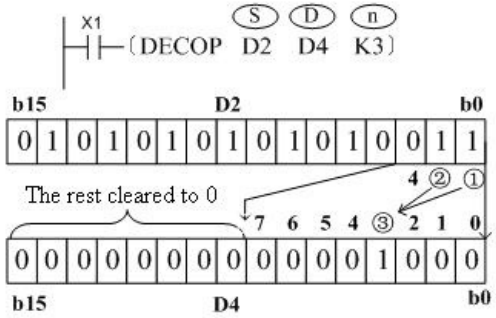
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔	✔	✔						✔	✔	✔	✔	✔
(D)		✔	✔	✔							✔	✔	✔		
(n)	Constant, n=1~8. If n=0, the instruction will not be implemented. If n ≠0, there will be an implementation error.														

- The low n bit(s) (n≤4) of the source address is translated to target address. If n≤3, the higher bits of the target address is set to 0;
- If n=0, the instruction is not implemented. If n is not within the range of 0 to 8, there will be a calculation error.
- When n=8, if the code translation instruction is bit soft component, the point number is 256.
- When driver output is OFF, the instruction is not implemented and the code translation output in operation will be implemented.

The instruction usually uses pulse operation type instruction.

Programming Illustration:


X10
S
D
n
〔DECOP X0 M10 K3〕
X2 X1 X0
0 1 1
4 ② ①
7 6 5 4 ③ 2 1 0
0 0 0 0 1 0 0 0
M17 M16 M15 M14 M13 M12 M11 M10


X1
S
D
n
〔DECOP D2 D4 K3〕
b15 D2 b0
0 1 0 1 0 1 0 1 0 1 0 1 0 0 1 1
The rest cleared to 0
4 ② ①
7 6 5 4 ③ 2 1 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
b15 D4 b0

DEDIV instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DEDIV	Binary	32	No	DEDIV (S1) (S2) (D)	13
DEDIVP	floating	32	Yes		13
	division				

This instruction is to implement binary floating division calculation, where,

(S1) and (S2) represent binary floating dividend and divisor respectively;

(D) is the starting address of the binary floating division result storage unit.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔							✔		
(S2)					✔	✔							✔		
(D)													✔		

If the source operand of (S1) or (S2) are constant K or H, it will be automatically converted to a binary floating value for division calculation;

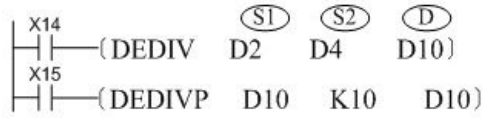
If the calculation result is 0, the 0 flag bit (M8020) will be reset.

If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.

If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.

The divisor should not be 0, or there will be an error and M8067, M8068 will be set to ON.

Programming Illustration:



When X14=ON and the binary floating variable (D3,D2) are divided by the binary floating variable (D5,D4), the result will be saved in (D11,D10).

When X15 is set from OFF to ON, the binary floating (D11,D10) is divided by 10 and then the result is saved back to (D11,D10).The constant K10 is automatically converted to a binary floating value before calculation.

The storage unit for the result could be the storage unit for the dividend or divisor, in which the pulse-type DEDIVP instruction is recommended, or the continue implementation instruction will be applied, in which the calculation will be implemented every time when the program is scanned.

DEMUL instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DEMUL	Binary	32	No	DEMUL (S1) (S2) (D)	13
DEMULP	floating-point	32	Yes		13
	multiplication				

The instruction performs multiplication operation based on the binary system, where (S1) and (S2) represents the multiplicand and the multiplier in the binary system.

(D) is the product storage unit of the binary floating-point multiplication.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔							✔		
(S2)					✔	✔							✔		
(D)													✔		

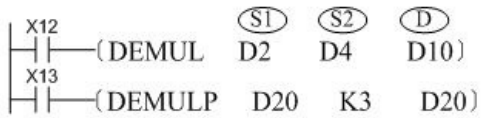
Should the source operand of (S1) or (S2) be constant K or H, it will automatically convert the constant to a binary floating-point value to further perform multiplication operation.

If the calculation result is 0, the 0 flag bit (M8020) will be reset.

If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.

If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.

Programming Example:



When X12 = ON, after the binary floating-point (D3, D2) multiplies the other binary floating-point (D5, D4), the product will be stored in (D11, D10).

When X13 turns from OFF to ON, the binary floating-point (D21, D20) value will be multiplied by 3 (three) and saved back in (D21, D20) The constant K3 has already been automatically converted to a binary floating-point value prior to the calculation.

The storing unit for the multiplication product can be treated as one unit with the multiplicand and the multiplier. Please use the pulse execution instruction DEMULP under this circumstance. Otherwise, if selected the progressive execution instruction, the multiplication operation will be carried out again every time when the program is scanned.

DESQR instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DESQR	Binary floating-point square root	32	No	DESQR (S) (D)	9
DESQRP		32	Yes		9

The command performs the square root calculation of the binary floating-points, where:

(S) is the binary floating-point variable that is to be square rooted.

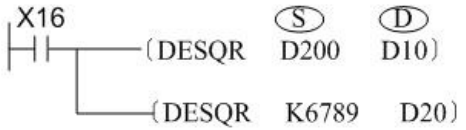
(D) is the product storage unit of the binary floating-point square root.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔							✔		
(D)													✔		

Should the operand (S) is the constant K or H, it will be automatically converted to a binary floating-point value and square rooted; if the result of calculation is zero, it will be flagged and positioned at M8020.

(S) will only be effective when the value is positive. There must be errors in the calculation if it appears as negative. In this case, M8067, M8068 will be positioned as ON.

Programming Example:



The binary floating radication result is saved to（D11，D10）.
The binary floating number K6789 is implemented with radication calculation and then the result is saved to (D21, D20), where the constant K6789 is automatically converted to binary floating data before implementation;

DESUB instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Applicable operand soft components	Step
DESUB	Binary floating-point subtraction	32	No	DESUB (S1) (S2) (D)	13
DESUBP		32	Yes		13

The instruction performs subtraction operation based on the binary floating-point system, where:

(S1) and (S2) represents the minuend and the subtrahend in the binary floating-point system.

(D) is the difference storage unit of the binary floating-point subtraction.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔							✔		
(S2)					✔	✔							✔		
(D)													✔		

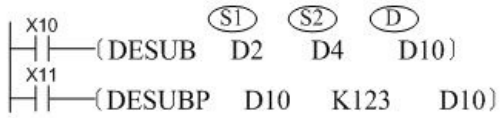
Should the source operand of (S1) or (S2) be constant K or H, it will automatically convert the constant to a binary floating-point value to further perform subtraction operation;

If the calculation result is 0, the 0 flag bit (M8020) will be reset.

If the calculation result absolute value is greater than the maximum displayable floating value, the carry flag (M8022) will be set.

If the calculation result absolute value is less than the minimum displayable floating value, the borrow flag (M8021) will be set.

Programming Example:



When X10 = ON, after the binary floating-point (D3, D2) subtracts the other binary floating-point (D5, D4), the difference result will be stored in (D11, D10).

When X11 turns from OFF to ON, the value of the binary floating-point requires to subtract 123.The constant K123 is automatically converted to binary floating value before calculation.

The storing unit for the subtraction difference can be seemed as same one unit with the subtrahend and minuend. Please use the pulse execution instruction DESUBP under this circumstance. Otherwise, if selected the progressive execution instruction, the subtraction operation will be carried out again every time when the program is scanned.

DEZCP instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DEZCP	Binary floating-point zone comparison	32	No	DEZCP (S1) (S2) (S) (D)	17
DEZCPP		32	Yes		17

The instruction compares the inter-zoning variables of binary floating-points, and then exports the result to the three (3) initiative variables, where:

(S1) represents the inter-zoning minimum of the binary floating-point variables.

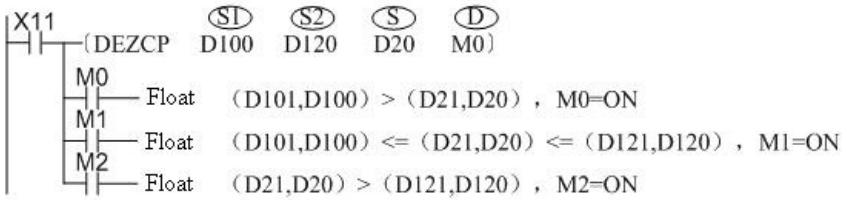
(S2) represents the inter-zoning maximum of the binary floating-point variables.

(S) represents the binary floating-point variable that is to be compared.

(D) is the storage unit for comparison result, occupying three variable units.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔							✔		
(S2)					✔	✔							✔		
(S)					✔	✔							✔		
(D)		✔	✔	✔											

Programming Example:



DHSCR instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DHSCR	Comparison	32	No	DHSCR (S1) (S2) (D)	13
	Reset (Every time when the system is counting, after it has compared the counted value and the assigned value, the system immediately resets the external output (Y))				

When (S2) counter's current value equals the assigned value of (S1), it resets to (D), where:

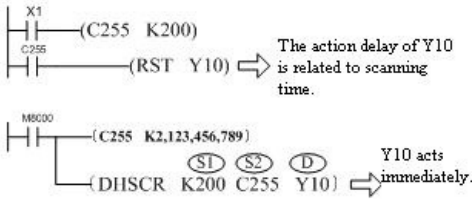
(S1) is the designated comparison value. The value's scope (in bit) depends on the bit value of the (S2) counter.

(S2) variable must correspond to the high-speed counter C235~255. Because the counters engaged are all 32-bit counters, the 32-bit instruction, DHSCR, must be used.

(D) represents the storage unit of the comparison result: when the resulting port range is between Y0~Y17, results will be immediately exported; when the port is after Y20, results will only be exported after the user program has completed the scanning; when M and S becomes variables, the system will immediately refresh the storage unit.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)												✔			
(D)		✔	✔	✔											

Programming Example:



Instruction Instruction:

The operating principle of HSCR instruction is similar to that of HSCS instruction. The only difference is that the comparison exporting operation of HSCR is opposite of the HSCS instruction, which means that assigned export reset will only initiate after the counter has reached the same value with the designated value. Please refer to the instruction in the HSCS section.

DHSCS instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DHSCS	Comparison Reset (Every time when the system is counting, after it has compared the counted value and the assigned value, the system immediately resets the external output (Y))	32	No	DHSCS (S1) (S1) (D)	13

When (S2) counter's current value equals the assigned value of (S1), it resets to (D), where:

(S1) is the designated comparison value. The value's scope (in bit) depends on the bit value of the (S2) counter.

(S2) variable must correspond to the high-speed counter C235~255. Because the counters engaged are all 32-bit counters, the 32-bit instruction, DHSCS, must be used.

(D) represents the storage unit of the comparison result: when the resulting port range is between Y0~Y17, results will be immediately exported; when the port is after Y20, results will only be exported after the user program has completed the scanning; when M and S becomes variables, the system will immediately refresh the storage unit.

When (D) is between I010~I060, the subprogram for interrupting 0~5 in the high-speed counter needs to be initiated. It is certain that the corresponding interrupting subprogram, the initiation of relevant interrupting permissible signal, and the overall interrupting permissible signal must be properly programmed in order to intercept the counter when necessary. M8059 that is positioned as ON prohibits all intercepting procedures over high-speed counters.

Operand	Bit component	Word component

Operand	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)												✔			
(D2)		✔	✔	✔											

Differences between Y outputs under general and DHSCS instructions: for instance

1. When the present value of C255 is changing from 99 to 100, the C255 contact point will immediately become conductive. However, when the system is running the procedure to OUT Y10, because Y10 is still under the scanning cycle influence, it will only be exported after the process has reached END.

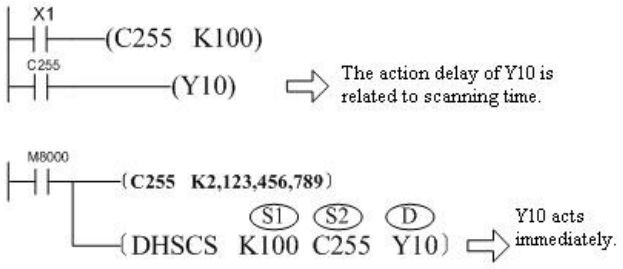
2. When the present value of C255 is changing from 99 to 100 and 101 to 100, the Y10 output under the DHSCS instruction is exported immediately to the external output port in an interceptive manner. It has no relevance to the PLC scanning cycle.However, the output will still be delayed due to the influences of the output module relay or transistor outputs.

High-speed interruption indicator and setup:

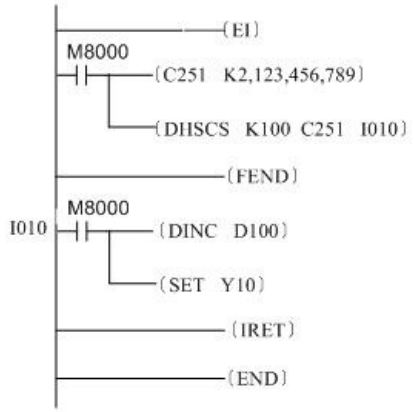
Operand	Interruption Prohibiting Instruction
I010	M8059
I020	
I030	
I040	
I050	
I060	

Programming Example

Programming Illustration 1:



Programming Illustration 2:



The D operand range for DHSCS instruction can also be specified 10□0, □=1~6. Interrupt occurs when counter reaches the setting value.
All high speed counter interrupts are disabled if M8059=ON.
Note that ON type difference between I010 and output point Y, M, S used by D device in this case:
Y output point: If the present value of C251 is changed from 99 to 100 or 101 to 100, Y will turn ON immediately and remain ON all the time. After that, even if the compare result of C251and K100 becomes unequal, Y will remain ON unless other reset instruction is executed.

Instruction for use:

When using the HSCS instruction please ensure the counters have already been activated (see instruction example 1). Otherwise the counter's value will not change.

- The counter uses an interceptive method to influence the counter's input signals and perform real-time comparison. Should the comparison satisfies the matching relation, comparison output will be reset immediately. Take instruction example 1 for instance, when the present value of C255 changes from 99 to 100, or from 101 to 100, Y10 will be reset and remain in the reset state. Even if the comparison results of C255 and K100 are not equal, Y10 will still remain in ON status until other reset instruction has been introduced.

- System instruction's comparison output is determined based on the pulse input comparison result. If there was no pulse input, even if editing instructions such as DMOV or DADD is used to edit the contents in the high-speed counter C235~C255, comparison output will still bring no difference. Also, using any instruction to initiate power flow will not be able to change the result as well.

- If Y port is used for instruction output, it must be within the range from Y0 to Y17. Only then the immediate response can be guaranteed; Initiate the HSCS instruction multiple times or initiate the instruction with the HSCR and HSZ commends. This way the top 2 digits of the target output Y can be treated as a soft component of the same serial number. Example: Y000~Y007 when using Y000; Y010~Y017 when using Y010;

- When the HSCS instruction's output target is to interrupt I010~I060, every interrupting signal can only be used once and cannot be repeated.

- Like other general instructions, HSCS, HSCR, and HSZ instructions can be used multiple times. However, six is the limit number to execute these instructions simultaneously.

DHSZ instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DHSZ	inter-zoning compare	32	No	DHSZ (S1) (S2) (S) (D)	17

According to the present value of the counter (S), comparisons will be conducted with the designated (S1) and (S2) inter-zoning values. Comparison results will be immediately exported to the initial three units starting from the (D) address, where:

(S1) represents the inter-zoning minimum of the designated comparison zones. The value's width (in bit) is determined based on the bits of the (S) counter. The value must be no greater than (S2). Therefore, (S1)=(S2);

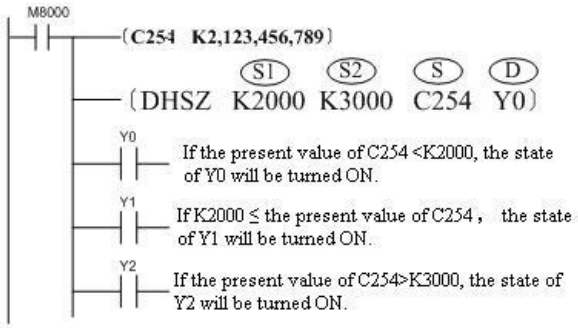
(S2) represents the inter-zoning maximum of the designated comparison zones. The value's width (in bit) is determined based on the bits of the (S) counter. The value must be no less than (S1). Therefore, (S1)=(S2);

(S) variable must correspond to the high-speed counter C235~255. Because the counters engaged are all 32-bit counters, the 32-bit instruction, DHSZ, must be used.

(D) represents the storage unit of the comparison result, which uses the first three units with sequential addresses starting from (D): when the resulting port range is between Y0~Y17, results will be immediately exported; when the port is after Y20, results will only be exported after the user program has completed the scanning; when M and S becomes variables, the system will immediately refresh the storage unit.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S)												✔			
(D)		✔	✔	✔											

Programming Example:



Instruction for use:

The operating principle of this instruction is the same as the HSCS and HSCR instructions. There differences are that it uses two comparative values, and the comparison output uses three sequential address units. Therefore, some operating note can be referred to the operation instruction in the HSCR section; HSZ instruction also uses interruptive method in its operation. The comparison process and the regeneration of corresponding output will only proceed when there are counting pulses happening at the counter’s corresponding input end;

DIV instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DIV	BIN Division Operation	16	No	DIV (S1) (S2) (D)	7
DIVP		16	Yes		7
DDIV		32	No		13
DDIVP		32	Yes		13

The instruction requires contact points activation and three operating variables. Values of the dividend (S1) and divisor (S2) will first multiply with the BIN algebra, and then the result is saved in (D). All variables involved in the operation are processed according to the symbol number ⊐ and the highest is the symbol bit. 0 represents as positive, and 1 as negative.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S)								✔	✔	✔	✔	✔	✔		

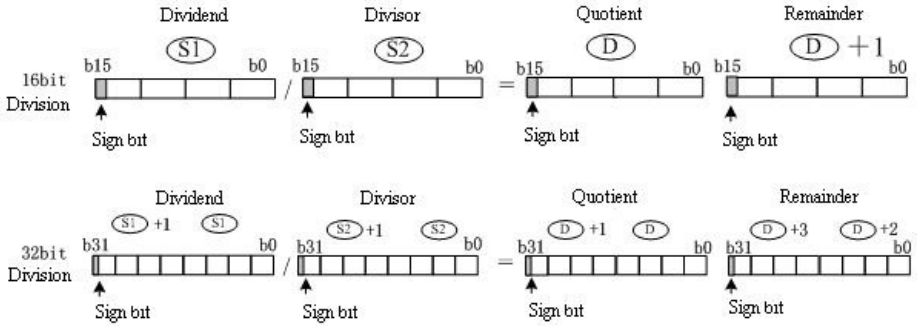
The V and Z components in the chart can only be used in 16-bit operation.

While performing 32-bit operation, the (S1) and (S2) variable addresses in the instruction are low 16-bit addresses. The neighboring high serial address units are high 16-bit and are used to prevent duplicates or erroneous re-writes during programming. The calculated quotient will be saved in the indicated (D) and (D)+ 1 unit. The remainder will be saved in (D)+2 and (D)+3 address units.

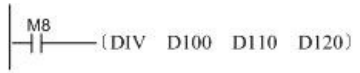
If the divisor (S2) equals two, erroneous calculation will occur;

If bit components (KnX/KnY/KnM/KnS) are assigned as (D), no remainder will be obtained;

If the dividend is negative, remainder will be negative as well.



Programming Example



When M8 is set, the content in the dividend D100 will be divided by divisor D110 and saved to D120. For example, if D100=K5, D100=K5, then D110=K2 and the quotient will be saved to D121, that is D121=K1.

DRVA instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DRVA	Absolute Positioning	16	No	DRVA (S1) (S2) (D1) (D2)	9
DDRVA		32	No		17

Based on the designated port, frequency, and the direction of the output pulses, the instruction allows the server to commence machinery movement to an appointed destination. Only the PLC with the transistor output can execute the instruction, where:

(S1) is the designated target position (absolute position). When commend is in 16-bit, the range is from -32,768 to 32,767; when it is in 32-bit, the range is from -2,147,483,648 to 2,147,483,647.

If (D1) = [Y000], the corresponding [D8141 (high byte), D8140 (low byte)] (in 32-bit) will become the absolute position.

If (D1) = [Y001], the corresponding [D8143 (high byte), D8142 (low byte)] (in 32-bit) will become the absolute position.

If (D1)= [Y002], the corresponding [D8151 (high byte), D8150 (low byte)] (in 32-bit) will become the absolute position.

If (D1) = [Y003], the corresponding [D8153 (high byte), D8152 (low byte)] (in 32-bit) will become the absolute position.

(S2) represents the designated output pulse frequency, and it ranges from 10 to 32,767Hz (in 16-bit instruction); or from 10 to 100,000Hz (in 32-bit);

(D1) is the pulse output port; for 1S model, only Y0 or Y1 is selectable. The 2N model can assign Y0/Y1/Y2/Y3 and etc.

The (S2) operating direction output port or the variant can be determined according to (S1) and the difference compared with current position. When the output is ON, it means the system is operating in the forward direction, and reverse direction vice versa.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D1)		✔													
(D2)		✔	✔	✔											

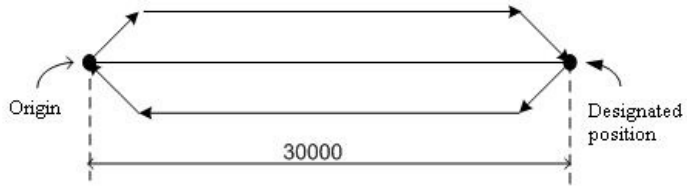
Even if the operand contents are being changed during the instruction execution process, it will not show the effect in the currently running operation. The change will only become effective in next instruction execution.

When the instruction-driven contacts become OFF during the execution process, the machine will start to decelerate and eventually stop. The completion signal of M8029 will be executed at this time and not further action will be carried out.

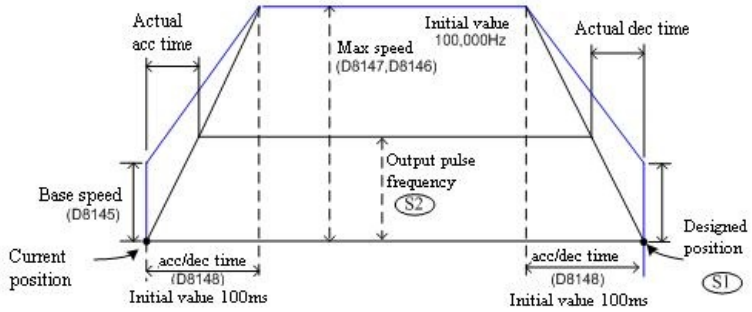
When the instruction-driven contacts become OFF and the pulse output interruption signals, M8147 (Y000), M8148 (Y001) are on, the re-initiating instruction will not be accepted.

Programming Example:

The instruction is a type of control method to control the operating movement of machinery from the assigned origin toward the designated point.



During the pulse output process, the frequency will either accelerate or decelerate according to the preset value.



The actual minimum pulse output frequency is determined according to the following formula:

Minimum pulse output frequency = $\sqrt{\text{Max speed[D8147,D8146]HZ} \div (2 \times \text{Acc/dec time[D8148]ms} \div 1000))}$

Even if the assigned value is lower than the above calculated result, the frequency to be exported will still be the calculated value. The frequencies in the initial stage of acceleration and in the final section of deceleration must not be lower than the above calculated result. During the instruction execution, the involved system

variables are as follows:

∓D8145ヤ: Base speed when executing FNC158 (DRVI) and FNC159 (DRVA) instructions. During the operation of stepping motor, the stepping motor's resonance region and automatic start frequency must be considered when setting up the speed. Setting Range: below 1/10 of the highest speed (D8147, D8146). When the setting surpasses the indicated range, the operating speed will automatically decelerate to the 1/10 of the highest speed.

[D8147 (high byte), D8146 (low byte)]: Maximum speed when executing FNC158 (DRVI) and FNC159 (DRVA) instructions. The assigned output pulse frequency must be lower than the maximum speed. Setting range: 10 ~100 , 000 クHzグ

[D8148]: acceleration and deceleration time when executing FNC158 (DRVI) and FNC159 (DRVA) instructions. Acceleration/Deceleration time means the time required in order to reach the maximum speed (D8147, D8146). Therefore, when the output pulse frequency is lower than the maximum speed (D8147, D8146), the actual acceleration/deceleration time will reduce. Setting range: 50 ~ 5コ000 (ms)

∓M8145ヤ : Y000 pulse output stopping (immediate stopping)

∓M8146ヤ : Y001 pulse output stopping (immediate stopping)

∓M8152ヤ : Y002 pulse output stopping (immediate stopping)

∓M8153ヤ : Y003 pulse output stopping (immediate stopping)

∓M8147ヤ : Y000 pulse output monitoring (BUSY/READY)

∓M8148ヤ : Y001 pulse output monitoring (BUSY/READY)

∓M8149ヤ : Y002 pulse output monitoring (BUSY/READY)

∓M8150ヤ : Y003 pulse output monitoring (BUSY/READY)

Notice:

Positioning instruction (ZRN/PLSV/DRVI/DRVA) can be reused in the program, but do not output to the same port;

If the drive power flow for an instruction turns OFF and ON again, it can only be driven after one operation cycle when status bit (Y000: [M81471], Y001: [M8148] ,Y002: [M8149], Y003:[M8150], turns OFF.

When positioning instruction is driven again, there should be at least one cycle of OFF time. If the re-drive is implemented in the time less than above condition, there will be calculation error when firstly implementing calculation instruction.

DRVI instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DRVI	Relative	16	No	DRVI (S1) (S2) (D1) (D2)	9
DDRVI	Positioning	32	No		17

Based on the assigned port, frequency, and the assigned pulse output value of the operating direction, the instruction allows machines to perform offset movement according to its present position. Only the PLC with the transistor output can execute the instruction, where:

(S1) represents the assigned output pulse value. When commend is in 16-bit, the range is from -32,768 to 32,767; when it is in 32-bit, the range is from -2,147,483,648 to 2,147,483,647. The negative symbol indicates the opposite direction.

(S2) represents the assigned output pulse frequency. When instruction is in 16-bit, the range is 10~32,767Hz; when in 32-bit, the range is 10~100,000Hz;

(D1) is the pulse output port; for LX 1S only Y0 or Y1 can be assigned. Th e LX 2N can assign Y0/Y1/Y2/Y3, and etc;

(D2) is the operating direction output port or variant. When the output is in ON state, the system is operating in the forward direction, and vice versa.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D1)		✔													
(D2)		✔	✔	✔											

Output pulse value is treated as the relative position when comparing with the current value of the register described below:

When exporting to [Y000], the current register value is [D8141 (high byte), D8140 (low byte)] (in 32-bit).

When exporting to [Y001], the current register value is [D8143 (high byte), D8142 (low byte)] (in 32-bit).

When exporting to [Y002], the current register value is [D8151 (high byte), D8150 (low byte)] (in 32-bit).

When exporting to [Y003], the current register value is [D8153 (high byte), D8152(low byte)] (in 32-bit).

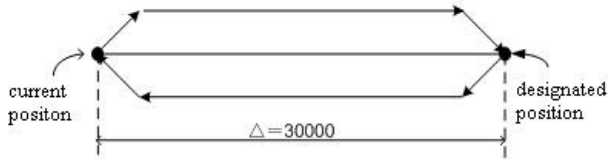
Even if the operand contents are being changed during the instruction execution process, it will not show the effect in the currently running operation.

When the instruction-driven contacts become OFF during the execution process, the machine will start to decelerate and eventually stop. The completion signal of M8029 will be executed at this time and not further action will be carried out.

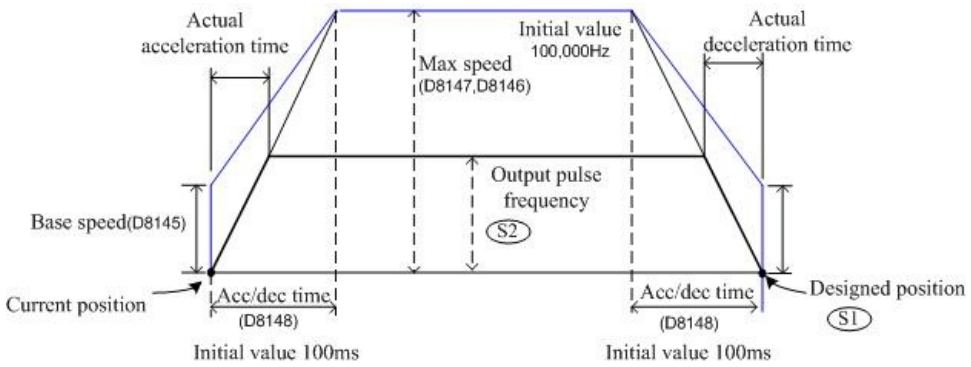
After the instruction-driven contacts become OFF, and the pulse output interruption signals M8147 (Y000), M8148 (Y001), M8149 (Y002), M8150 (Y003), are in ON state, re-initiation instruction will not be accepted.

Programming Example:

With 30000 pulses exported from the Y0 port at the frequency of 4 kHz, the external server allows the machine to operate in directions that are determined by Y3.



During the pulse output process, the frequency will either accelerate or decelerate according to the preset value.



The actual minimum pulse output frequency is determined according to the following formula:

Minimum pulse output frequency = $\sqrt{\text{Max speed[D8147,D8146]HZ} \div (2 \times \text{Acc/dec time[D8148]ms} \div 1000)}$

Even if the assigned value is lower than the above calculated result, the frequency to be exported will still be the calculated value.The frequencies in the initial

stage of acceleration and in the final section of deceleration must not be lower than the above calculated result.

During the instruction execution, the involved system variables are as follows:

〒D8145ヤ: Base speed when executing FNC158 (DRVI) and FNC159 (DRVA) instructions. During the operation of stepping motor, the stepping motor's resonance region and automatic start frequency must be considered when setting up the speed. Setting Range: below 1/10 of the maximum speed (D8147, D8146). When the setting surpasses the indicated range, the operating speed will automatically decelerate to the 1/10 of the highest speed.

[D8147 (high byte), D8146 (low byte)]: Maximum speed when executing FNC158 (DRVI) and FNC159 (DRVA) instructions. The assigned output pulse frequency must be lower than the maximum speed. Setting range: 10 ~100 , 000 クHzグ

[D8148]: acceleration and deceleration time when executing FNC158 (DRVI) and FNC159 (DRVA) instructions. Acceleration/Deceleration time means the time required in order to reach the maximum speed (D8147, D8146). Therefore, when the output pulse frequency (S2) is lower than the maximum speed (D8147, D8146), the actual acceleration/deceleration time will reduce. Setting range: 50 ~ 5,000 (ms)

〒M8145ヤ : Y000 pulse output stopping (immediate stopping)

〒M8146ヤ : Y001 pulse output stopping (immediate stopping)

〒M8152ヤ : Y002 pulse output stopping (immediate stopping)

〒M8153ヤ : Y003 pulse output stopping (immediate stopping)

〒M8147ヤ : Y000 pulse output monitoring (BUSY/READY)

〒M8148ヤ : Y001 pulse output monitoring (BUSY/READY)

〒M8149ヤ : Y002 pulse output monitoring (BUSY/READY)

〒M8150ヤ : Y003 pulse output monitoring (BUSY/READY)

Notice:
Positioning instruction (ZRN/PLSV/DRVI/DRVA) can be reused in the program, but do not output to the same port;
If the drive power flow for an instruction turns OFF and ON again, it can only be driven after one operation cycle when status bit (Y000: [M81471], Y001: [M8148] ,Y002: [M8149], Y003:[M8150], turns OFF.
When positioning instruction is driven again, there should be at least one cycle of OFF time. If the re-drive is implemented in the time less than above condition, there will be calculation error when firstly implementing calculation instruction.

DSIN instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DSIN	Floating point SIN calculation	32	No	DSIN (S) (D)	9
DSINP		32	Yes		9

The instruction is used to calculate the SIN value of the designated angle (RAD, radian). The variables are in the storage format of binary floating points, where:

(S) is the angle variable that needs to be calculated in order to obtain SIN value. The unit is in RAD, and the value is expressed in binary floating points.Value Range0<=α<=2π;

(D) is the storage unit for the SIN calculation results after its conversion. It is in binary floating point format.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)													✔		

Programming Example:

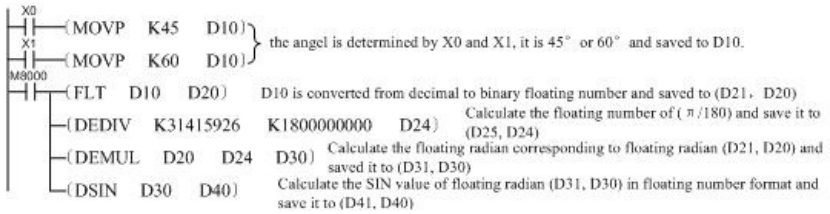
Example 1 for instruction:

The calculated source data and SIN results are all in binary floating point value format.

RAD(radian)value＝angle×π/180°,for example, the radian corresponding to angle 360°＝360°×π/180°＝2π.

Example 2 for instruction:

According to angel calculated sin vaule:


X0
MOVP K45 D10
X1
MOVP K60 D10
the angel is determined by X0 and X1, it is 45° or 60° and saved to D10.
M8000
FLT D10 D20
D10 is converted from decimal to binary floating number and saved to (D21, D20)
DEDIV K31415926 K1800000000 D24
Calculate the floating number of (π/180) and save it to (D25, D24)
DEMUL D20 D24 D30
Calculate the floating radian corresponding to floating radian (D21, D20) and saved it to (D31, D30)
DSIN D30 D40
Calculate the SIN value of floating radian (D31, D30) in floating number format and save it to (D41, D40)

DSW instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DSW	Digital Switch	16	No	DSW (S) (D1) (D2) (n)	9

The instruction is used to read the status of matrix-setting switch. One set includes four BCD setting switches. After settings are read, they will be saved in the designated units. Two are the maximum number of switch sets that can be read, where

(S) is the starting port button of scanning input X port. If (n)=1, the four succeeding X ports will be used; if (n)=2, the eight succeeding X ports will be used.

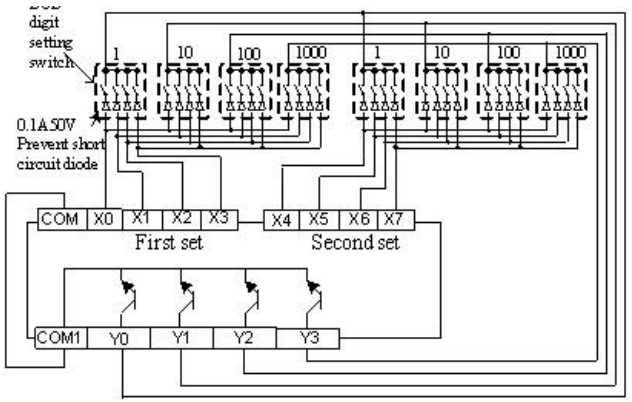
(D1) is the starting port button of scanning output Y port, and it uses the four succeeding Y ports.

(D2) is the input value storing unit, 0~9999;

(n) is the number of switch set. Only 1~2 can be selected.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔														
(D1)		✔													
(D2)											✔	✔	✔	✔	✔
(n)	Constant コnツ 1~2														

Programming Example:

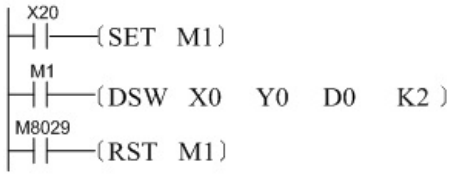


Perform the operation to scan and read the digit switch setting if X 20=ON.
1. The setting values for the first set of digit switches are converted to BIN and saved to D 0;
2. The setting values for the second set of digit switches are converted to BIN and saved to D 1;
3. M8029 will be set for one scanning cycle after one-time reading is completed.

Instruction for use:

Only the PLCs with transistor outputs can detect the digital switch.

- The READ operation of one digital switch requires multiple scanning cycles to complete. If the READ operation is activated using buttons, it is recommended to use the following programming statements to ensure the readable cycle's integrity.



DTAN instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
DTAN	Floating point TAN calculation	32	No	DTAN (S) (D)	9
DTANP		32	Yes		9

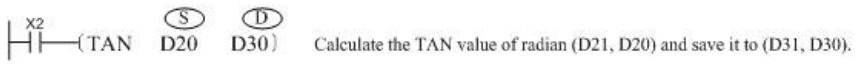
The instruction is used to calculate the TAN (tangent) value of the designated angle (RAD, radian). The variables use the binary floating point storage format.

(S) is the angle variable that needs to be calculated to obtain the TAN value. The unit is in RAD, and the value is expressed in binary floating points. Value Range 0<=α<2π;

(D) is the storage unit for the TAN calculation results after its conversion. It is in binary floating point format.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)													✔		

Programming Example:



The calculated source data and SIN results are all in binary floating point value format.

RAD(radian)value＝angle×π/180°,for example, the radian corresponding to angle360°=360°×π/180°=2π.

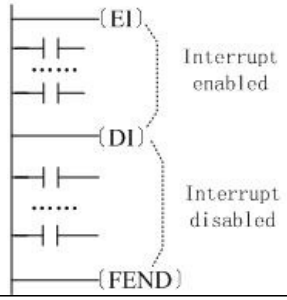
In regards to the programming statements used to calculate the TAN value, please refer to the example in the SIN instruction section.

EI⊥DI instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
EI	Permissible Interruption	16	No	No operand, independent instruction that does not require initiating contacts	1
DI	Prohibitive Interruption	16	No		1

When PLC program is in operation, interruption is prohibited; after the execution of EI instruction, interruption function has become permissible; when DI instruction is executed during the permissible interruption status, the system enters the status of prohibitive interruption. In the programming, if there is no inter-zoning interruptive prohibition insertions, DI instruction cannot be executed.



Interrupt types and setting:

1) External signal input interrupts: they can be defined to trigger interrupts by rising or falling edges. For an X signal that doesn't need an immediate response, pulse capture function can also be used;

2) Timer interrupts: they occur every fixed period of 1ms~99ms.

3) High speed interrupts: they are used with DHSCS comparison setting instruction. Interrupt occurs when the present value of a high speed counter reaches the setting value.

External Signal Input Interruption Indication and Setup:

Input No.	Pointer No.		Interrupt disabled instruction
	Rising edge interrupt	Falling edge interrupt	
X000	I001	I000	M8050
X001	I101	I100	M8051
X002	I201	I200	M8052
X003	I301	I300	M8053
X004	I401	I400	M8054
X005	I501	I500	M8055

Timing Interruption Indicator and Setup:

Input No.	Interrupt period (ms)	Interrupt disable instruction
I6□□	Input 1~99 to □□ in the instructions, for example, I605, which executes one timing interrupt every 5 ms	M8056
I7□□		M8057
I8□□		M8058

High-speed interruption indicator and setup:

Input No.	Interrupt disable instruction
I010	M8059
I020	
I030	
I040	
I050	
I060	

Pulse Output Completion and Interruption Indicator and Setup: (the function requires the activation of M8090~M8094 in order to generate interruption after pulse output has been completed)

Port No.	Use special bit	Related user interrupts
Y000	M8090	I502
Y001	M8091	I503
Y002	M8092	I504
Y003	M8093	I505
Y004	M8094	I506

Interrupting sub-program uses different numbers to select different ports and interruption trigger edge;

External input interrupt can only be applied on same X, and it cannot be applied to both ascension and descension interrupting numbers at the same time. Only one trigger edge can be applied to one X input port. The trigger edge can be configured through indicator numbers.

External input interrupt: if M8050-M8055 is in the status of "ON" during the program execution process, the interruption function of the corresponding X port is prohibited.

Timing Interruption: if M8056-M8058 is in the status of "ON" during the program execution process, the interruption function of the corresponding X port is prohibited.

High-speed counter interruption: if M8059 is in the status of "ON" during the program execution process, the interrupting function of all the high-speed counters is prohibited.

Interruption instruction's programming requirements and execution features:

- Interruptions can be applied in between the D1 and E1 instructions (between the zones of prohibitive interruptions). The instruction can be saved in memory and later on executed after the EI instruction.
- Indicator number cannot be reused.
- When multiple interruptions are occurring in sequence, the prioritization is based on the sequence. When interruptions are happening all at the same time, the priority will base on it level of classification. The priorities from high to the low end are: high-speed counter, external, timing, pulse output completion.
- During the interruption execution process of regular programs, other interruptions are prohibited. However, if EI and DI instruction programs are being edited under the interruptive sub-programs, a maximum of two interruptions can be programmed.
- During the interruption process, both input and output relays can be controlled. By executing the input/output refresh instruction (REFF), the most current input status can be read, and the calculation results can be exported immediately to realize the task of high-speed control.For input relay numbers that are to be used by interruption indicator, please do not use numbers that are used in application instructions such as [high-speed counter] and [pulse density], which choose from the same input range.
- For the timer used in sub-programs and routine interruption programs, please use the T192-T199 timer specifically for the routine program. Should other regular timers be used, not only it cannot carry out the timing function, extra caution must be paid when using the 1ms cumulative timer.
- If the input interruption indicators, I and 0 ports, are designated, the input filter feature of the input relay will be automatically shut off. Therefore, it is unnecessary to use the REFE instruction and the special data register D8020 (input filter adjustment). Besides, the input filter of the input relay that is not being used by the input interruption indicator can maintain for 10ms (initial value).

In order to satisfy the operation of the high-speed counter, 30 additional high-speed counting interruptions are added. This allows any designated high-speed interruption to produce 30 interruption responses. The function is called "Multiple User-designated Interruption Feature" of high-speed counter. The operating configuration follows the following patterns:

Flag bit	description
M8084	Set to ON to enable high speed counter multi-user interrupts
D8084	High speed counter no. C235~C255
D8085	Related user interrupt numbers, 24 max from I507 to I530
D8086	Correspond to the serial numbers of several compare point data and can be used as D component only, such as 200, which represents a double word starting from D200.

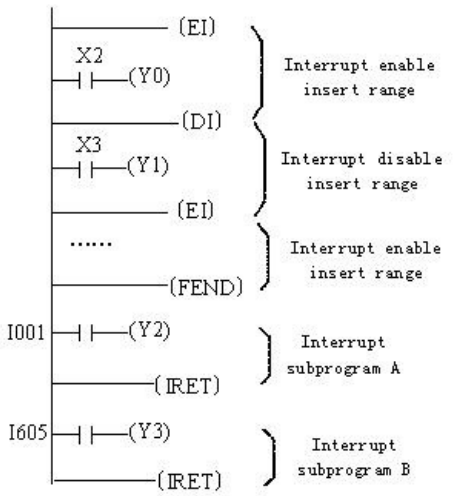
Example of the Comparison Point Data Storage:

D8084=235;D8086=200;D8085=5;M8084=ON;

The data in C235	Recording unit	Save unit value	Related user interrupts	Value in D8131
100	D200、D201	=100	I507	0
200	D202、D203	=200	I508	1
300	D204、D205	=300	I509	2
400	D206、D207	=400	I510	3
500	D208、D209	=500	I511	4→0(M8133=ON)

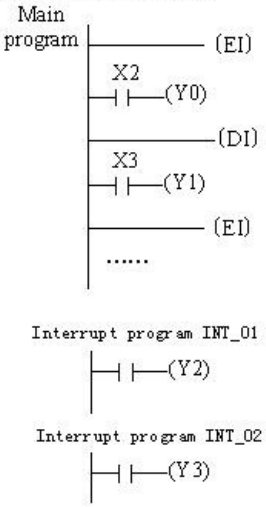
Every interruption can be produced by the values in the high-speed counter and the recorded units.

Programming Example



In PLC operation, if the program between EI instruction and DI instruction is scanned or 5ms time is up, execute interrupt subprogram A or B; if the subprogram is executed to IRET, return to main program and continue to operation.

See the program in the left diagram in AutoShop: (right click the interrupt program INT_01 or INT_02 for this program and select attribute to rename it, including Chinese name)



Interrupt program INT_01

Interrupt program INT_02

Right click interrupt program INT_01 and INT_02 for the program block and select attribute-interrupt items: set to I001 and I605 respectively

ENCO instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ENCO	Programming (obtain the data's ON position and convert it to BIN data)	16	No	ENCO (S) (D) (n)	7
ENCOP		16	Yes		7

Calculate (n)'s position value in(S)as the bit indicator. Use the corresponding position of (D)as 1, and others are all 0.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔	✔							✔	✔	✔	✔	✔
(D)											✔	✔	✔	✔	✔
(n)	Constant, n=1~8. When n=0, the instruction will not execute; other values will be debugged.														

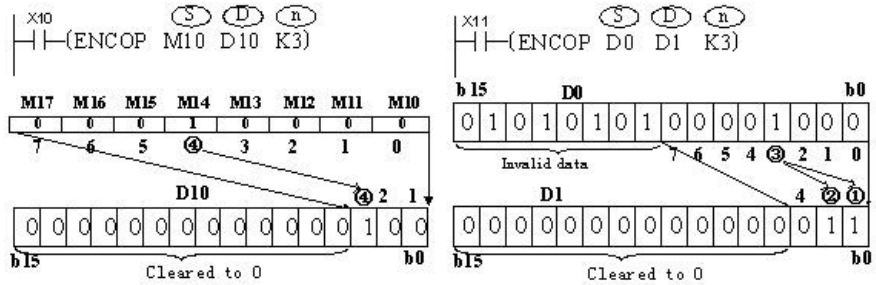
When there are multiple positions in the source address that has the value of 1, only the position at the high end side with the first 1 will be calculated; Error message will appear when all positions of (S)are 0;

When driver input is OFF, the instruction will not be executed, and the output number will not change.

When n=8, if the programming instruction (S) is a digital component, it has 256 dots.

The instruction usually uses pulse operation type instruction.

Programming Illustration:


X10
(ENCOP M10 D10 K3)
S
D
n
M17 M16 M15 M14 M13 M12 M11 M10
0 0 0 1 0 0 0 0
7 6 5 ④ 3 2 1 0
D10
④ 2 1
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
b15
b0
Cleared to 0
X11
(ENCOP D0 D1 K3)
S
D
n
b15
D0
b0
0 1 0 1 0 1 0 1 0 0 0 0 1 0 0 0
Invalid data
7 6 5 4 ③ 2 1 0
D1
4 ② ①
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1
b15
b0
Cleared to 0

FLT instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
FLT	Converting BIN from integrals to binary floating points.	16	No	FLT (S) (D)	5
FL TP		16	Yes		5
DFLT		32	No		9
DFLTP		32	Yes		9

The instruction coverts the integral (S) to floating digits, and saves the result in (D) and (D)+1 units.

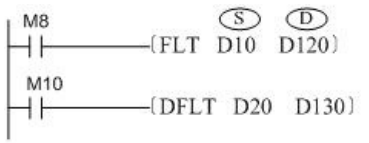
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)													✔		

Constants K and H will be converted automatically in every floating point calculation instruction. Therefore, FLT instruction cannot be used here.

The instruction's inverse transformation instruction is INT (converts binary floating point values to BIN integrals).

Programming Illustration

Example 1 for instruction:



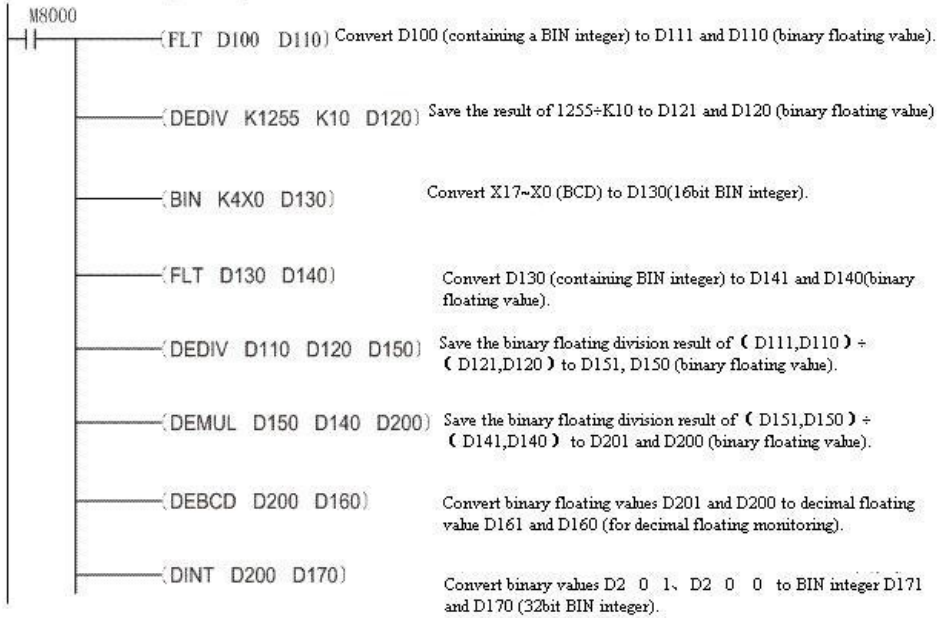
When M8=ON, 16bit number D10 (16bit BIN integer) is converted to binary floating point number and saved to (D121, D120).

When M10=ON, 32bit number D10 (D21, D20) (32bit BIN integer) is converted to binary floating point number and saved to (D131, D130).

Example 2 for instruction:

Use instructions to implement the following floating operation.

D100/K125.5*(X17~X0)=D200


M8000
FLT D100 D110
Convert D100 (containing a BIN integer) to D111 and D110 (binary floating value).
DEDIV K1255 K10 D120
Save the result of 1255÷K10 to D121 and D120 (binary floating value)
BIN K4X0 D130
Convert X17~X0 (BCD) to D130(16bit BIN integer).
FLT D130 D140
Convert D130 (containing BIN integer) to D141 and D140(binary floating value).
DEDIV D110 D120 D150
Save the binary floating division result of (D111,D110)÷(D121,D120) to D151, D150 (binary floating value).
DEMUL D150 D140 D200
Save the binary floating division result of (D151,D150)÷(D141,D140) to D201 and D200 (binary floating value).
DEBCD D200 D160
Convert binary floating values D201 and D200 to decimal floating value D161 and D160 (for decimal floating monitoring).
DINT D200 D170
Convert binary values D2 0 1、D2 0 0 to BIN integer D171 and D170 (32bit BIN integer).

FMOV instruction

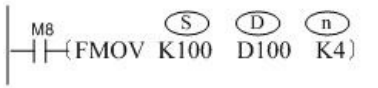
Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
FMOV	Multiple Point	16	No	FMOV (S) (D) (n)	7
FMOVP		16	Yes		7
DFMOV		32	No		13
DFMOVP		32	Yes		13

It requires contact driver, and it has three operating variables. (S) data will be copied and saved in the (n) units, which the start address is designated by (D).

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		
(n)	Constant,nツ1~512														

Programming Illustration



The following operation is completed when M8=ON.

k100 → D100
k100 → D101
k100 → D102
k100 → D103

FOR,NEXT instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
FOR	Begin the Cycle Range	16	No	FOR (S1)	3
NEXT	End the Cycle Range	-	-	NEXT (no operand)	1

FOR is used to begin a cycle and indicate the number of times the cycle will be executed. It must be used together with the NEXT instruction. Where: (S1) is the cycle frequency controlling variable.

NEXT Instruction is used to indicate the end portion of the cycle. FOR instruction designates the number of cycles of FOR~NEXT to be repeated. After the cycles have been completed, it will exit from the FOR~NEXT cycle and continue the operation.

Between each cycle of FOR~NEXT instructions, another FOR~NEXT cycle may be inserted. However, the condition is, calculating from the outermost FOR~NEXT cycle, only 4 FOR~NEXT cycles can be inserted. During the operation, PLC will analyze and execute FOR~NEXT based on each corresponding cycle. Please note that when there are excessive numbers of cycles, the PLC scanning cycle will be prolonged. This may cause the timeout monitor timer to activate and lead to potential errors.WDT instruction may be implemented between the FOR~NEXT instruction to prevent errors.

Error messages will appear under the following situations:

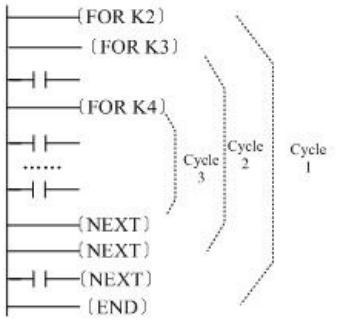
- NEXT instruction is programmed prior to FOR instruction;
- FOR instruction is programmed but not NEXT instruction;

Disagreement between the numbers of FOR and NEXT instructions.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

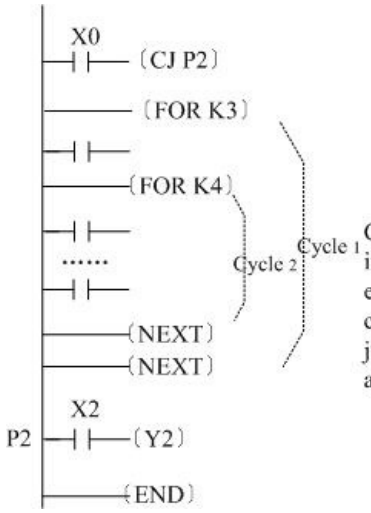
Programming Illustration

Example 1 for instruction:



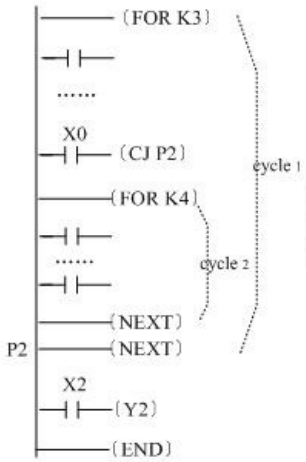
When cycle 1 is executed twice, it will continue to execute program after NEXT instruction. Every time cycle 1 is executed once, cycle 2 will be executed twice, whiled every time cycle is executed once, cycle 3 will be executed four times. Thus, cycle 3 will be executed for 2*3*4=24 times in total and cycle 2 2*3=6 times.

Example 2 for instruction:



CJ instruction can be used to skip FOR~NEXT instruction. In the example, if X0=OFF, execute cycle 1 and 2; if X0=OFF, executed cycle 1 and 2; when X0= ON, CJ instruction jumps to P2 and the program between cycle 1 and cycle 2 will not be executed.

Example 3 for instruction:



CJ instruction can also be used to skip inner nesting FOR~NEXT instruction. In the example, if X0=OFF, execute cycle 1 and 2; if X0=ON, CJ instruction jumps to P2 and cycle 2 nested inside cycle 1 will be skipped.

FROM instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
FROM	BFM Read out	16	No	FROM (m1) (m2) (D) (n)	9
FROMP		16	Yes		9
DFROM		32	No		17
DFROMP		32	Yes		17

The instruction is used to read the data retrieval operation of the BFM register in the special extended module.

(m1) is the address serial number of the special extended module, whose value ranges 0~7. 0 is the closest to the main module and the number goes on. Maximum of 8 special modules are allowed.

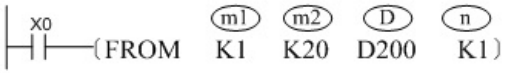
(m2) is the register address code of BFM inside the special module. It has values ranging from 0~32767;

(D) is the storage address after reading the parameters in the main module. When the number of register read is more than one, it occupies the following units.

(n) The number of parameters read during the operation (counted by Word). It has values ranging from 1~32767. The values will be read in sequence according to the register addresses.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)								✔	✔	✔	✔	✔	✔	✔	✔
m1=0~7; m2=0~32767; n=1~32767; When designating (D) component, instructions in 16-bit can use K1~K4; instructions in 32-bit can use K1~K8; m1, m2, and n do not support character devices and D registers.															

Programming Illustration



When X0 is ON, retrieve the content of the twentieth address (in 16-bit) in #1 special module to the D200 register. One retrieval at a time (n=1). When X0 is OFF, no operation will be executed.

When using instructions in 32-bit, addresses designated by (D) are the low 16-bit addresses; addresses designated by (D)+1 are the high 16-bit addresses.

GBIN instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
GBIN	Gray Code's Inverse Transformation	16	No	GBIN (S) (D)	5
GBINP		16	Yes		5
DGBIN		32	No		9
DGBINP		32	Yes		9

The instruction converts the GRY Gray Code to binary values. Where:

(S) is the GRY data source or data variable unit is to be converted; when instruction is in 16-bit the range is 0~32,767; 32-bit 0~3,147,483,647. When the value exceeds the indicated ranges, M8067 and M8067 will be set in ON, and the instruction will not execuate.

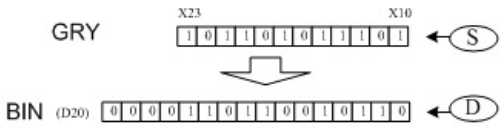
(D) is the storage unit after the value has been converted to BIN.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

GRY→BIN mathematical calculation: from the second digit from the left, calculate every digit with the decoded digit left to it, and use the value of the digit as the decoded value (the far left digit remains unchanged).

Programming Illustration

Example:



GRY instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
GRY	An instruction used to send original data sample	16	No	GRY (S) (D)	5
GRYP		16	Yes		5
DGRY		32	No		9
DGRYP		32	Yes		9

This instruction is used to convert BIN values to GRY codes. Where:

(S) is the BIN data source or data variable unit to be converted. M8067 and M8068 will be On and the instruction will not be executed if?exceeds the range, 0~32,767 for 16bit instructions and 0~2,147,483,647 for 32bit instructions.

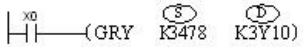
(D) is the unit where converted GRY code is stored.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

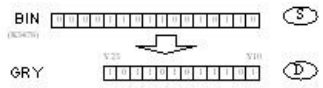
BIN→GRY mathematical algorithm: starting with the rightmost bit, sequently perform XOR operation for that bit to its left bit, and the resulted value will be the GRY value of that bit. While the leftmost bit stays unchanged (i.e. the left is 0);

Programming Illustration

Instruction example:



Execution result:



HEX instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
HEX	conversion of HEX	16	No	HEX (S) (D) (n)	7
HEXP		16	Yes		7

This instruction is used to convert the value of the starting variable of (S) into an ASCII code and store it in an address starting with (D). The number of chars and storage mode can be set by the user. Where:

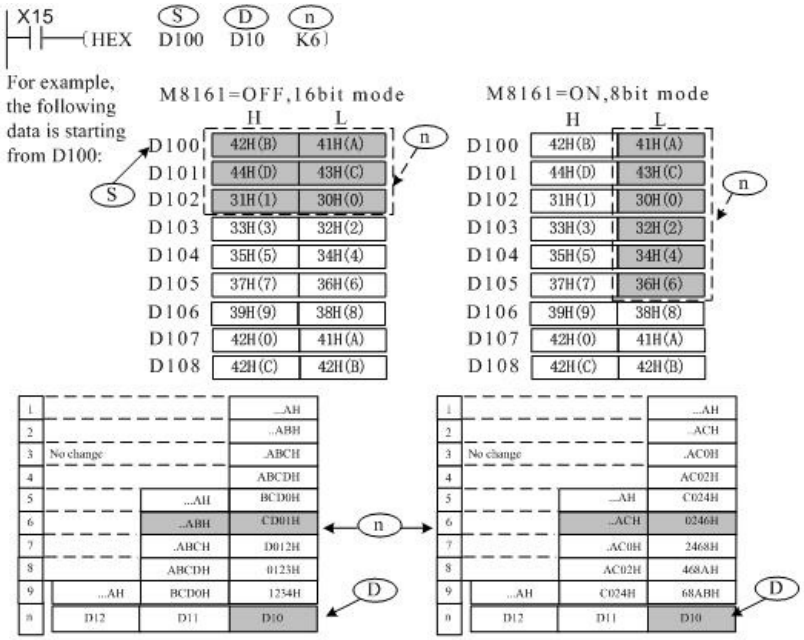
(S) is the variable address or constant to be converted. If it is a register variable, the conversion interval will has a width of a 32bit variable (i.e. 4 ASCII chars);

(D) will be converted into the starting address for storing the ASCII code, for which the variable space taken is depending on (n).

(n) is the number of bits of the converted ASCII chars.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔
(n)	Constant, n=1~256														

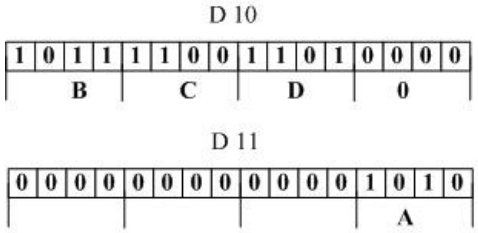
Programming Illustration



Where the mode of variable width is determined by the M8161 sign: M8161=OFF indicates 16bit mode, which means that both the upper byte and the lower byte are participating the operation; M8161=ON indicates 8bit mode, which means that only the lower byte is participating the operation and the upper byte will be abandoned, as a result the length of the actually used variable area (S) will increase.

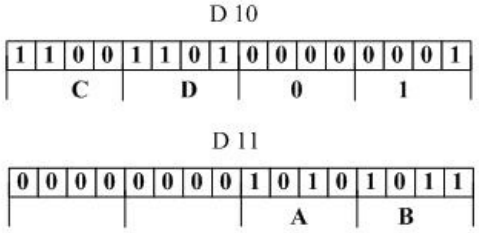
Bit component when M8161=OFF, n=5

Use D100~D102 (high and low bytes) conversion



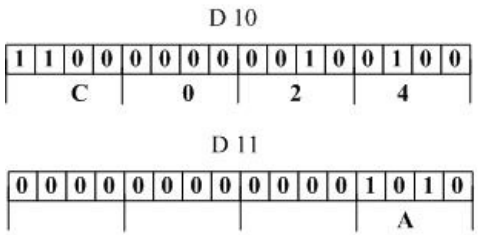
Bit component when M8161=ON, n=5

Use D100~D104 (low bytes) conversion



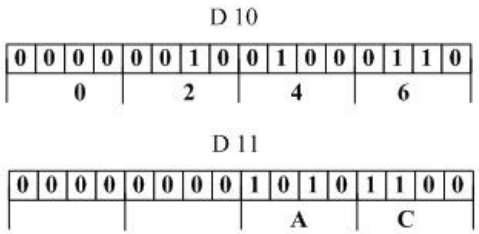
Bit component when M8161=OFF, n=6

Use D100~D102 (high and low bytes) conversion



Bit component when M8161=ON, n=6

Use D100~D102 (low bytes) conversion



Note:

It should be aware that the M8161 mode sign is shared by instructions of RS/HEX/ASCI/CCD, etc.

The source data of (S) data area must be of ASCII chars, otherwise errors will occur during the conversion.

If the output data if of BCD format, a BCD-BIN conversion is required after HEX convers to get the correct value.

HKY instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
HKY	16-key input	16	No	HKY (S) (D1) (D2) (D3)	9
DHKY		32	Yes		17

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔														
(D1)		✔													
(D2)											✔	✔	✔	✔	✔
(D3)		✔	✔	✔											

This instruction is used to read a 4×4 matrix of 16 keys, which are the decimal 0~9 keys and the functional keys of A~F sequentially. When the keys are pressed (ON), decimal numbers of 4 bits between 0~9999 or functional keys between A~F can be entered, depending on the sequence of the keypress actions. If 32bit instructions are used, decimal numbers of 8 bits between 0~99,999,999 or functional keys between A~F can be entered. Where:

(S) is the number of the starting port of the scanning input port X of the keys, 4 X ports starting with which will be used;

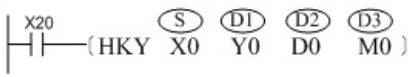
(D1) is the starting port button of scanning output Y port, and it uses the four succeeding Y ports.

(D2) is the storage unit for the entered values from the keys, with a range of 0~9999. If 32bit instructions are used, decimal numbers of 8 bits between 0~99,999,999 can be entered.

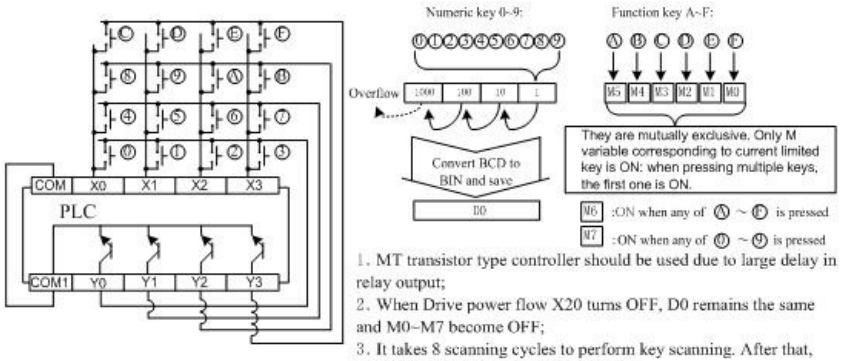
(D3) is the address of the starting unit of the entering status of the keys, which occupies a variable unit of 8 continuous bits.

This instruction can only be used for transistor-output type PLC.

Programming Illustration



Corresponding wiring diagram and parameter response instruction as follows:


Numeric key 0~9:
Function key A~F:
Overflow
Convert BCD to BIN and save
D0
M5 M4 M3 M2 M1 M0
They are mutually exclusive. Only M variable corresponding to current limited key is ON: when pressing multiple keys, the first one is ON.
M6 :ON when any of A ~ F is pressed
M7 :ON when any of 0 ~ 9 is pressed
COM X0 X1 X2 X3
PLC
COM1 Y0 Y1 Y2 Y3

1. MT transistor type controller should be used due to large delay in relay output;
2. When Drive power flow X20 turns OFF, D0 remains the same and M0~M7 become OFF;
3. It takes 8 scanning cycles to perform key scanning. After that, M8029 will be set for 1 scanning cycle;

●Since it takes several execution period to perform key scanning，use constant scanning mode or timing interrupt processing to avoid the influence on X port filtering.

●Notice for expansion function:

When special variable M8167 is set to ON, this instruction stores the 16bit data of keys **0~F** to (D2).

HOUR instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
HOUR	Timer	16	No	HOUR (S)(D1)(D2)	7
DHOUR		32	No		13

(S) This instruction is used to record the accumulative time during which the driving conditions are met. When the set time value is reached, the instruction output is activated. Where:

(D1) is the starting unit of the accumulative time;

(D2) indicates that the time has reached the warning output variable unit. When the set value is reached, the status specified for this unit is effective.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D1)													✔		
(D2)		✔	✔	✔											

The setting range of (D1) is K0~K32,767 (in hours) for 16bit (D1)+1 is the current time value that is less than an hour, with a setting range of K0~K3,599 (in seconds). At this time (D1) occupies 2 units.

The setting range (D1)+1 and (D1) is K0~K2,147,483,647 (in hours) for 32bit. (D1)+2 is the current time value that is less than an hour, with a setting range of K0~K3,599 (in seconds). At this time (D1) occupies 2 units.

Negative values are not applicable to instruction (D1) timing. If (D1) is set as the register area for non power failure holding, the value of (D1) will be zeroed when the PLC status is changed from STOP to RUN or at a power failure. If the data of the current value need to be kept even under the situation of PLC power failure, please set (D1) as the register area for power failure holding.

Programming Illustration

When M200=ON, the time this status is holding will be accumulated, the hour value is recorded in D300 and the second value less than 1 hour is recorded in D301. Y10 output status is switched ON when the accumulative time of D300 reaches 2000 hours. If the timing conditions are met, the accumulative timing continues and the readout value will continue to increase when the specified (S) value is reached. The timing will stop when the current time value of D300 reaches the maximum value of 32,767 hours and D301 reaches 3,599 seconds. You have to zero the current time values of D300 and 310 to restart a new timing.

INC instruction

Instruction Description

This guide specifies the plus 1 (+1) operation of the soft component data.

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
INC	BIN add 1	16	No	INC (D)	3
INCP		16	Yes		3
DINC		32	No		5
DINCP		32	Yes		5

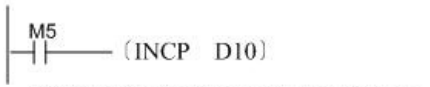
The value of (D) increases by 1 after each process.

For 16bit operations, 32,767 plus 1 gets -32,768.

For 32bit operations, 2,147,483,647 plus 1 gets -2,147,483,648.

This step will not refresh the "0" sign or the carry and borrow sign.

Programming Illustration



D10 is incremented by 1 every time M5 is set.

INCD instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
INCD	Increment method of cam control	16	No	INCD (S1) (S2) (D) (n)	9

This instruction is used to perform multi-segment comparisons for cam control. The table, timer, etc. used for the comparisons are all set incrementally. The instruction is implemented in the scanning main program, and the comparison result is effected by scan time delay. Where:

(S1) is the comparison table.

(S2) is the timer. The neighboring (S2) +1 unit is used to reset the time on the counter after the caluculation and comparison process. (32bit counters are applicable to 32bit instructions)

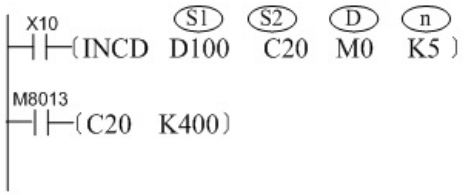
(D) is the comparison results record, which is a bit variable unit occupying (n) continuous addresses.

(n) is the number of multi-segment comparison sets.

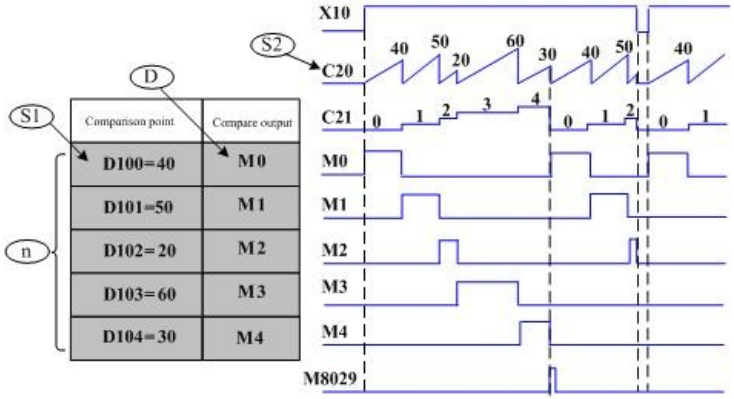
all point to 32bit variables when using 32bit instructions. (S1) (S2) (D) is also calculated based on the length of 32bit variables. When the set comparison of (n) is done, the "instruction done" flag "M8029" will automatically switch on one scanning cycle.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)							✔	✔	✔	✔	✔	✔	✔		
(S2)												✔			
(D)		✔	✔	✔											
(n)	Constant, nツ1~64;														
For 16bit - (S1) operation numbers KnX, KnY, KnM and KnS, "K4" must be specified. For 32bit -"K8" must be specified and the number of components X, Y, M and S must be in multiples of 8. (S1) operation numbers are limited to C0~C199 for 16bit instructions. (S1) operation numbers are limited to C200~C254 for 32bit instructions.															

Programming Illustration



If the relevant variables have been set as follows, when X10=ON, the implementation result is shown in the following figure.



Instruction for use:

- All the variables of the relevant tables should be assigned using the MOV instruction before beginning the INCD process.
- The comparison output is also affected by the delay of the user program scan. Therefore, the HSZ high speed comparison instruction can be used for applications that are needed quickly.
- The INCD instruction can only be used once in the program.

INT instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
INT	Conversion of binary floats to BIN integers	16	No	INT (S) (D)	5
INTP		16	Yes		5
DINT		32	No		9
DINTP		32	Yes		9

This instruction rounds a binary float. The fraction part will be abandoned and the resulted binary value will be stored in (D). Where:

(S) is the binary float variable to be round converted.

(D) is the storage unit of the resulted BIN integer after the conversion.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)													✔		

If the calculation result is 0, the 0 flag bit (M8020) will be reset.

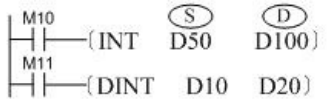
If any fractional part is abandoned during the operation, the borrow sign (M8021) will be set.

If the operation result exceeds the following ranges (overflow), the carry sign (M8022) will be set.

For 16bit instructions:-32,768~32,767

For 32bit instructions:-2,147,483,648~2,147,483,647

Programming Illustration



Floating value (D51, D50) is rounded and saved to (D100)

Floating value (D51, D50) is rounded and saved to (D21,D20)

Note the difference between the result saved by INT instruction and the result saved by DINT instruction

IST instruction

Instruction description:

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
IST	Status initialization	16	No	IST (S) (D1) (D2)	7

This instruction can be used to initialize the control status of a typical multi-action looping execution mechanism and to specify parameters for the operation mode such as the input signal, action status, etc. Where:

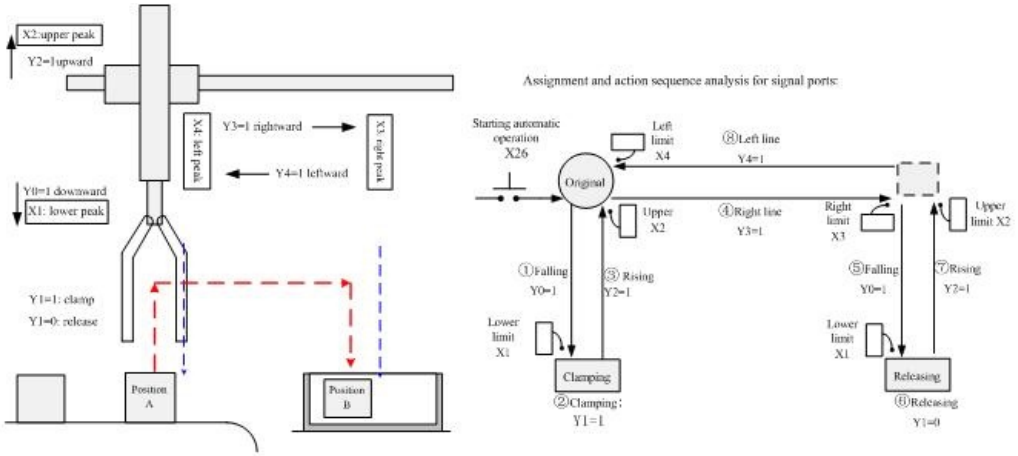
(S) is the component address of the starting bit variable of the input of the specified operation mode. It occupies 8 continuous address units from (S)~(S)+7.The special function definition for each varaible is described below:

(D1) is the minimum serial number using the S status in the specified automatic operation mode.

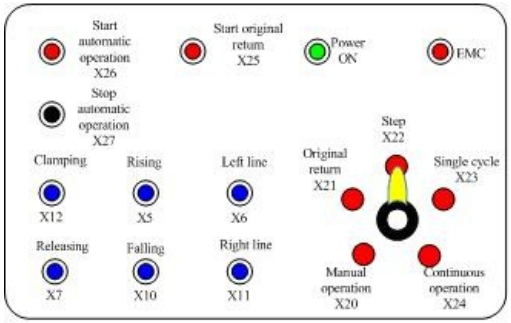
(D2) is the maximum serial number using the S status in the specified automatic operation mode.(D1) to (D2) are the status serial numbers of the looping action of the control system, which determine the status numbers.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔												
(D1)				✔											
(D2)				✔											
Notice: 1) The instruction is allowed to be used only once in the user program. 2グ For (D1) and (D2) ,only S variables S20 to S899 can be used, and (D1) must be <(D2) 3グ The special M variable of the system will also be used when using this instruction.															

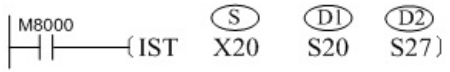
For example, in the illustrated system below, the execution mechanism acts sequentially in such a way: the grabbing device drops to the position of work piece A from the base point to grab the work piece, and then it lifts the work piece to the specified height and translates to the desired position and drops. After arriving at the required position, it releases the work piece and back tracks to start the next looping action. It is possible to use the IST instruction to specify the control signal input, the control of the status transferring, etc. of the operational mechanism to achieve automatic control. In addition, it supports manual commissioning of single-step actions and base point reset, etc.



Instruction keys and status changing switches are required to control the operational mechanism using manual commissioning, single actions, and looping actions, etc. The following is a schematic diagram of the operation panel, including the key ports and their function assignments:



For applications like the above diagram, each complete cycle can be divided into 8 steps (i.e. 8 statuses). The following instruction clauses can be used to initialize the status of the control system:



(S) specifies X20 as the starting input of the operation mode. Therefore, the input ports X21 to X27 of the subsequent addresses will also be used.The functional action features will be defined respectively as: (it is similar for variables X, M, or Y)

X20 :This is the manual operation mode to switch on/off the various control output signals using a single button.

X21 : This is the base point reset mode to reset the device to the base point by pressing the base point reset button.

X22 : This is the single-step operation mode to step forward a process each time the starting button is pressed.

X23 : The is the one-cycle looping mode. When the start button is pressed, it will run the one-cycle looping automatically and stop at the base point. The operation can be stopped by pressing the stop button. Then, if the start button is pressed, the operation will continue and stop at the base point automatically.

X24 : This is the continuous operation mode to run continuously by pressing the start button. When the stop button is pressed, it will move to the base point and stop.

X25 : To start the base point rest command signal.

X26 : To start the automatic command signal.

X27 : To stop the automatic command signal.

Note: In these port signals, the operation mode is determined by X20 to X24, for which the statuses can't be ON at the same time. Therefore, it is suggested to use rotary switches for the selection and switching of the signals.

(D1) and (D2) are used to specify the minimum and maximum serial number S20 to S27 of the service statuses (8 for total) in the automatic operation mode. The following special variables for the definition and use requirements of the IST instruction should be noted:

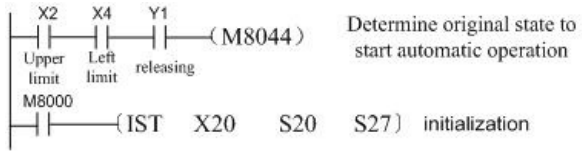
When driving the IST instruction, the control of the following components will be automatically switched and can be referenced by user programs. In order to make the status switching and control of the IST instruction cooperate, the operation of certain special variables is required in the user programs. See the description in the table below:

Default variables in IST instruction		Variables driven in user program	
M8040	1=disable transfer of all states	M8043	1=original return completed. In the original return mode, after a machine returns to original, the special M variable will be set by the user program.
M8041	1= transfer start	M8044	1=original condition. Detect the original condition of a machine and drive the special assistant relay. It is set in all modes.
M8042	1= start pulse	M8045	1=all output reset disabled. If a machine is switched among manual, return and automatic modes when it is not at original, all output and action states will be reset. But only action status can be reset if M8045 has been driven.
S0	Manual operation initial state	M8047	1=STL monitoring valid. After M8047 has been driven, the state number of action (S0 ~ S899) will be saved in the special assistant relay D8040 ~ D8047 in ascendent order, thus monitoring action state numbers of 8 points. In addition, if any of these states is enabled, the special assistant relay M8046 will act.
S1	Original return initial state		
S2	Automatic operation initial state		

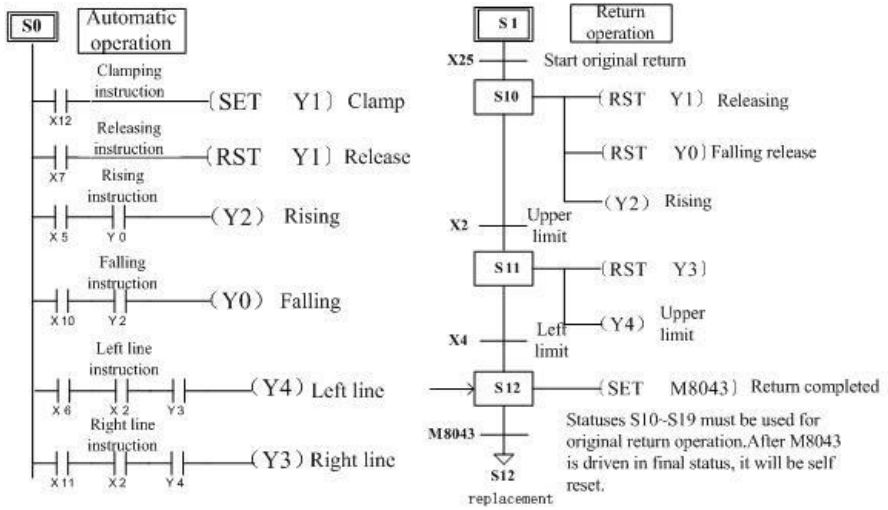
- Under the "automatic operation" mode, free conversion is possible between: single step<-->one-cycle looping<-->continuous operation.
- When performing conversion between "manual operation"<-->"base point reset"<-->"automatic operation" while the machine is running, the switched mode is effective after all the outputs are reset. (Reset is not applicable for M8045 drive.)
- S10 to S19 can be used for the base point reset when using the IST instruction. Therefore, don't use these statuses as common statuses. In addition; S0 to S9 are used for the initial status process, S0 to S2, as mentioned in the above manual operations, are used for the base point reset and automatic operation, and S3 to S9 can be used freely.
- When programming, the IST instruction must be programmed with a higher priority than the various STL circuit, such as status S0 to S2, etc.
- Rotary switches must be used to avoid the situation that X20 to X24 are ON at the same time.
- When switching between each (X20), base point reset (X21), auto (X22, X23, X24) before the base point completion signal (M8043) is activated, all the outputs are switched OFF. And the automatic operation can’t drive again until the base point reset is finished.

After initialization of the control instruction using the IST instruction, the action of each status of the execution mechanism and the conditions for status transferring need to be programmed, as detailed below:

1.System initialization: defines the conditions for base point reset and defines the input ports of the operation mode signals used in the IST instruction and the status variables of the looping actions. The program clauses used are illustrated in the following diagram.

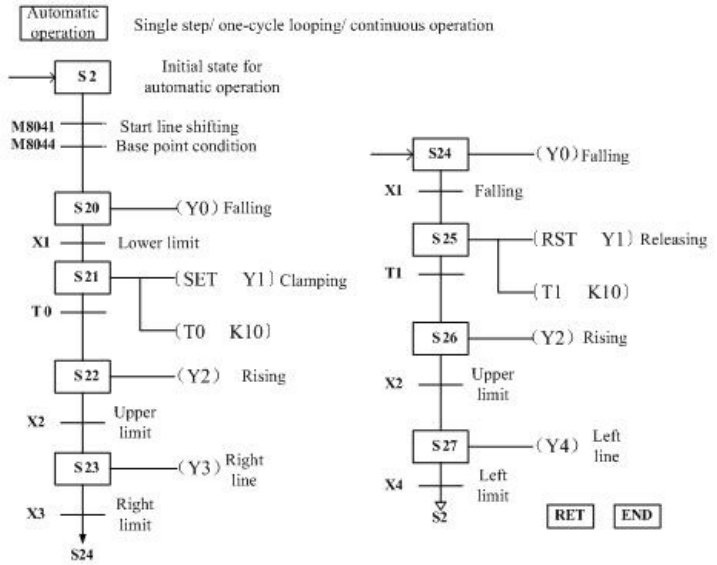


2ヂ Manual operation: driven to execute by the command signals defined on the operation plate. See the program clauses of status S0 in the following diagram. This part of the program can be skipped if there is no manual mode:



3ヂ Base point reset: design reset program based on the command signal at the starting of the reset and the sequence of the reset actions, as shown in the upper right:

4ヂ Automatic operation: write program based on the required action conditions and sequence and the control signal output, as shown in the diagram below:



Up to this point, the control system is allowed to complete the looping action according to the above mentioned action requirements. The above programming description uses step instructions for the convenience of reading, while the user is free to program using the equivalent ladder diagrams.

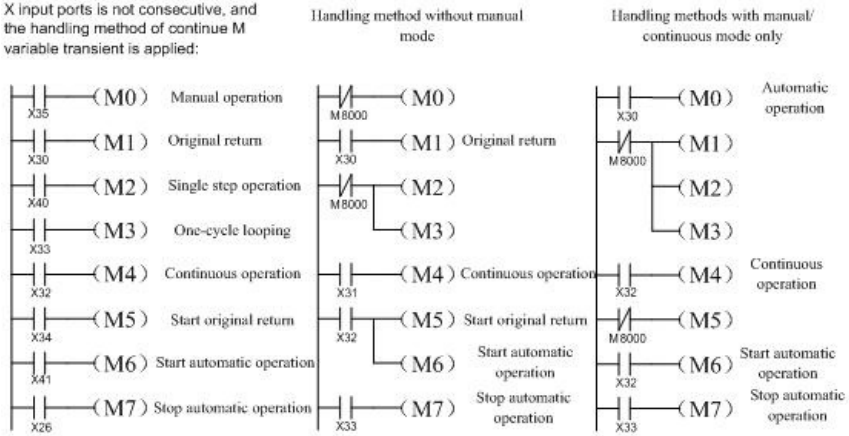
When different status numbers occur to the "automatic operation" mode in a control system, the above example can be referenced to program in modifying the setting items of (D1) and (D2) corresponding works need to be done in the "automatic operation" mode.

- Handling methods for non-continuous X input:

If an X input port with non-continuous addresses needs to be used as the provided input of the operation mode, the M variable can be used for a "transitional" transmission. That is, the non-continuous X input status will be copied to an M variable with continuous addresses one by one using the simple OUT instruction rather than the instructions below:

Specific to the continuous M0 to M7 variable area in the IST, the programming instructions can be used to shield the non-existent control mode. For example, the corresponding relationship between X as the mode input end and the M variable in the following diagram. For un-required modes, you simply input the M variable and fix it to zero:

X input ports is not consecutive, and the handling method of continue M variable transient is applied:



MEAN instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
MEAN	The instruction to calculate the mean value of a data set	16	No	MEAN (S) (D) (n)	7
MEANP		16	Yes		7
DMEAN		32	No		13
DMEANP		32	Yes		13

This instruction calculates the mean value of the (n) variables starting with (S) (sums them up and then divides by n) and stores it into (D).

Any remainder occur during the calculation will be abandoned.

An error will occur if the value of n is not in the range of 0~64.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔	✔	✔
(n)	Constant, n=1 to 64, otherwise an error will occur.														

Programming example:

(D10+D11+D12+D13)/4=D20
If D10=K5, D11K5, D12=K15, D13=K52, then D20=K19, the remainder will be rounded off.

MOV instruction

Instruction Description

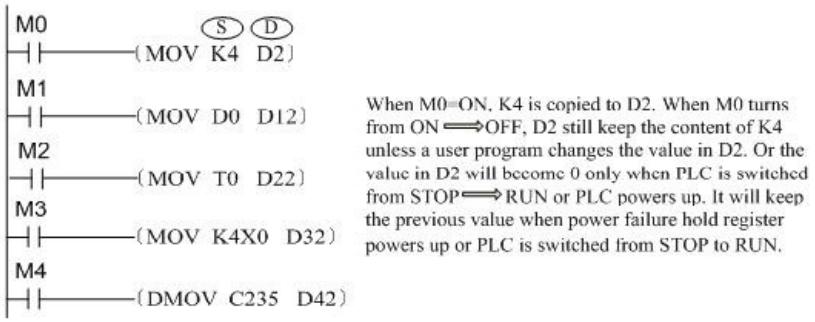
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
MOV	An instruction used to send original data sample	16	No	MOV (S) (D)	7
MOVP		16	Yes		7
DMOV		32	No		13
DMOVP		32	Yes		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

A contact drive is required. There are 2 operational variables to copy the value of (S) into (D).

For 32bit instructions (DMOV), both (S) and (D) will use the variable unit of the neighboring upper address for the calculation. For example, clause DMOV D1 D5 will result D1→D5 and D2→D6.

Programming example:



When M0=ON, K4 is copied to D2. When M0 turns from ON ⟹ OFF, D2 still keep the content of K4 unless a user program changes the value in D2. Or the value in D2 will become 0 only when PLC is switched from STOP ⟹ RUN or PLC powers up. It will keep the previous value when power failure hold register powers up or PLC is switched from STOP to RUN.

MTR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
MTR	Matrix input	16	No	MTR (S) (D1) (D2) (n)	9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔														
(D1)		✔													
(D2)		✔	✔	✔											
(n)	Constant,n=2~8														

This instruction is only applicable to the transistor output type PLC. 8 X ports and a number of Y ports are used to form the matrix input network to expand the channel number for the input signals. Where:

(S) is the starting address of the hardware port X for the matrix-scan input. It should be a numbered component with a lowest bit of 0 like X0, X10…, and it occupies 8 continuous bits.

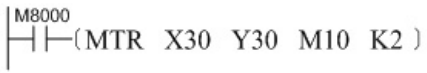
(D1) is the starting address of the hardware port Y for the matrix scan input. It should be a numbered component with a lowest bit of 0 like Y0, Y10…, and it occupies n (n=2 to 8) continuous bits.

(D2) is the starting address of the storage unit of the reading status of the matrix scan. It should be a numbered component with a lowest bit of 0 like Y0, Y10, etc.

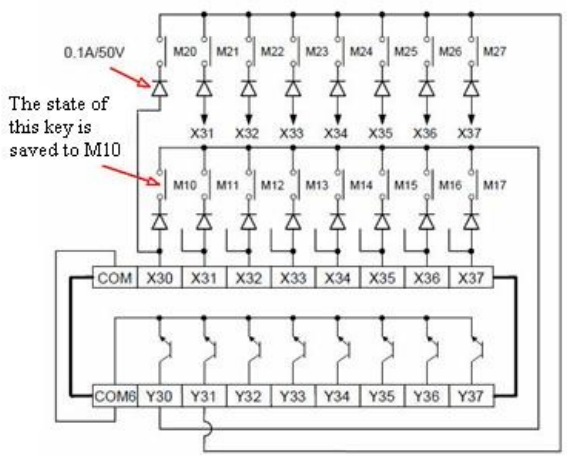
(n) is the number of the columns of the matrix scan, the number of the Y outputs used by the scan.

Typically, the normally ON contact M8000 is used as the condition contact for this instruction.

Programming example:



The following wiring is applicable:



Considering a response delay of 10ms for the X input filtering. The Y30 and Y31 outputs will be sequentially interrupted for each 20ms to perform the instant input/output process.

Each time after the automatic reading operation is done, the M8029 sign will switch ON a scanning cycle.

A scanning input with a maximum of 64 points can be achieved using 8-point X output and 8-point transistor Y output. But it is not suitable for high speed input operations because it needs a time of 20ms,8 colums = 160ms to read each input. Therefore, the ports after X20 are typically used as the scanning inputs.

This instruction is allowed to be used only once in the program.

MUL instruction

Instruction Description

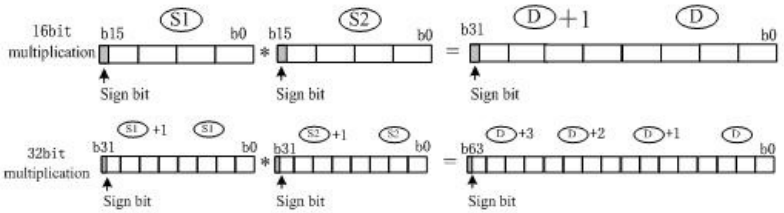
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
MUL	multiplication operation	16	No	MUL (S1) (S2) (D)	7
MULP		16	Yes		7
DMUL		32	No		13
DMULP		32	Yes		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔		

A contact drive is required. There are 3 operational variables, the algebra product of the values of (S1) and (S2) is stored into (D) . All the variables involved are treated as signed numbers, the upperest bit indicates the sign, 0 for positive numbers and 1 for negative numbers.

The V and Z component in the above table are only applicable for 16bit operations.

For 32bit operations, the variable address in the instruction is the lower than 16bit address, the neighboring higher numbered address unit is 16bit higher to avoid repeating or overwriting. As the calculation result can only be of 32bit, float operation instruction EMUL should be used for operations might exceed the range of 32bit.



Programming example:

When M8 is set, the content of multiplicand D100 is multiplied by the content of multiplier D110 and saved to D120.If D100=K5, D110=K9, then D120=5×9=K45

If D100=K1234, D110=K5678, then D120,d121=1234×5678=K7006652. Note that the product is higher than 16bit in this case and it needs to use neighboring high bits D121 and D120 in D.

NEG instruction

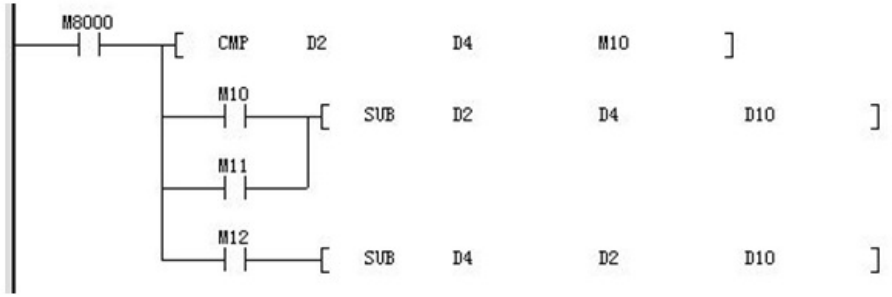
Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
NEG	complementation	16	No	NEG (D)	3
NEGP		16	Yes		3
DNEG		32	No		5
DNEGP		32	Yes		5

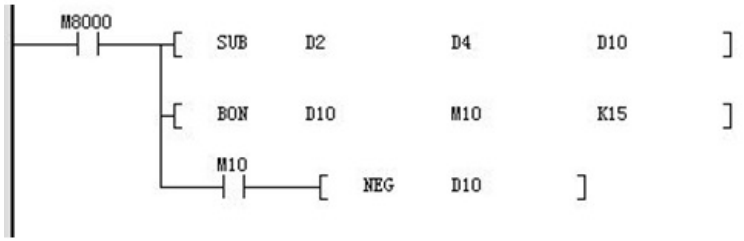
A contact drive is required and there is 1 operational variable. The value of (D) is conversed bit by bit, and then the resulted value is added up with 1 and stored into (D). Typically this instruction is of pulse execution type. To get the absolute value corresponding to the negative BIN value, the NEG instruction can be used.

Programming example:

Take the absolute value of a subtraction operation



If D2>D4, then M10=On; if D2=D4, then M11=On; and if D2<D4, then M12=On. By this way it can be ensured that the value of D10 is always positive. This program can be illustrated by the following process flow



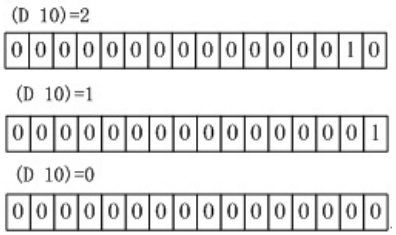
When bit15 of D10 is "1" (indicates that D10 is negative), M10=On. The complemented value of D10 by instruction NEG will be the absolute value of D10.

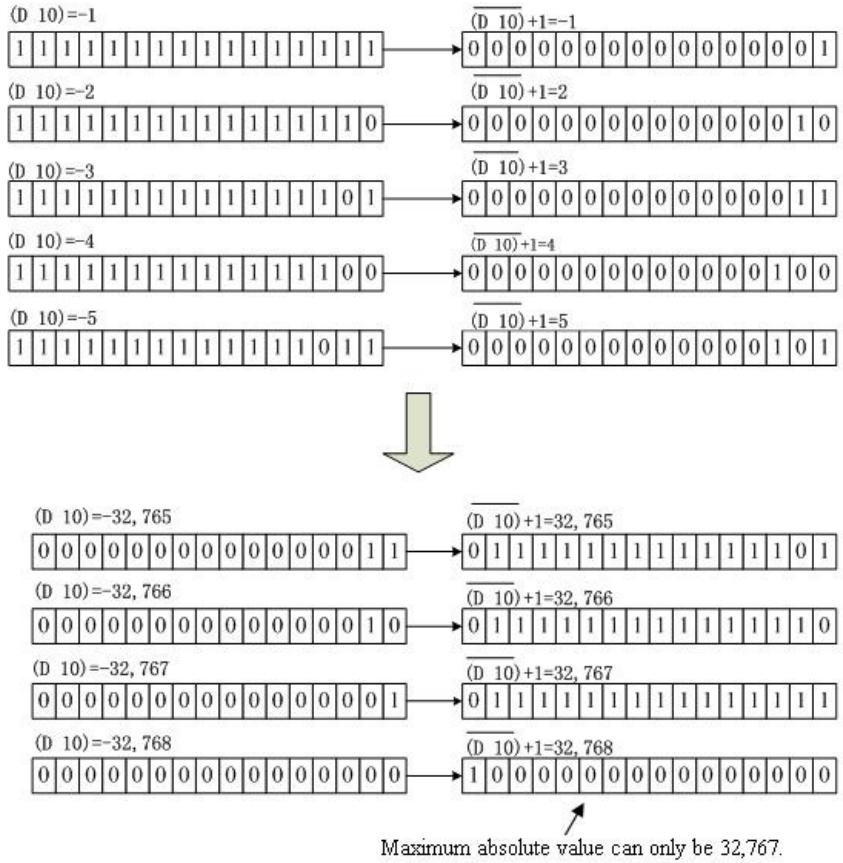
In both examples above, the result for D10 is K4ifD2=K4,D4= K8orD2=K8,D4=K4.

Additional remarks:

1. If a number is positive or negative, it is indicated by the value of the highest bit (the leftmost), "0" for positive and "1" for negative.

2. If the value of the highest bit is 1, the NEG instruction can be used to convert it into the absolute value.




(D 10)=-1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
(D 10)+1=-1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
(D 10)=-2
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0
(D 10)+1=2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
(D 10)=-3
1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1
(D 10)+1=3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1
(D 10)=-4
1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0
(D 10)+1=4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
(D 10)=-5
1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1
(D 10)+1=5
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1
(D 10)=-32, 765
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1
(D 10)+1=32, 765
0 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1
(D 10)=-32, 766
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
(D 10)+1=32, 766
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0
(D 10)=-32, 767
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
(D 10)+1=32, 767
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
(D 10)=-32, 768
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(D 10)+1=32, 768
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Maximum absolute value can only be 32,767.

PID instruction

Instruction description

Name	Function	bits	Pulse mode or not	Instruction format	Step number
PID	PID algorithm	16	no	PID (S1) (S2) (S3) (D)	9

operand	Bit element						Word element								
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)													VII		
(S2)													VII		
(S3)													VII		
(D)													VII		

This instruction is for PID algorithm, use for control of close-loop system parameter. PID control is widely used in mechanical equipment, pneumatic equipment, constant pressure water supply, electronic equipment and so on. one of them:

(S1) is target value of PID control

(S2) is feedback value of actual measurement

(S3) is used for setting parameter for PID algorithm, cache region starting address of the intermediate result save, take up subsequent address, total 25 variable unit, data range is D0~D7975, it better to assign a power failure conservation area to keep the setted value while the power off, or need to render the assignment for cache region while starting algorithm at the first time. detail of every unit function and parameter description, pls see the explanation in this section.

(D) The conservation area for result of PID algorithm, pls assign (D) as non- battery conservation area, or need initialize it into 0 while starting algorithm at the first time.

Program case

Parameter description:

Save the target value of PID in D9, close-loop feedback value in D10, note D9, D10 must be the same dimension, such as all are 0.01MPA, or 1 “, and so on.

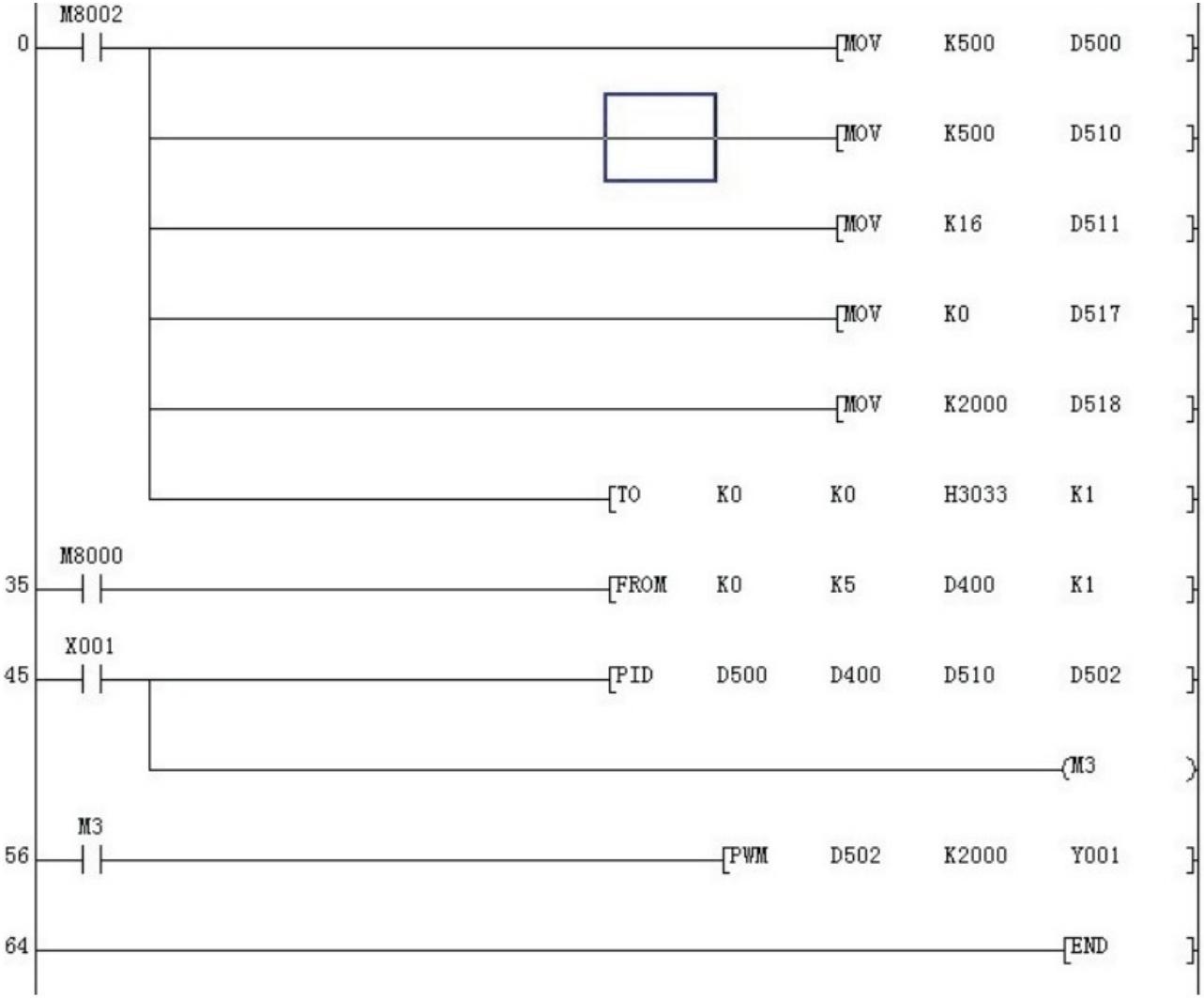
D200～D224, total 25 unit is used for save the set value and process value and need to set those value item by item before starting PID algorithm at the the first time.

D130 unit is used for save the control output value after algorithm and control the movement made.

(S3) each unit parameter value function and the setting way is shown below:

unit	function	Setting description
Ⓢ3	Sampling timeクTSグ	Setting range 1ㄐ32767クmsグコbut must longer than scanning cycle of plc program
Ⓢ3+1	Direction of actionクACTグ	bit0チ0ツpositive actionヂ1ツnegative action bit3チ0ツone wayヂ1ツtwo way bit4チ0ツself tuning non actionヂ1ツexecute self tuningコothers cannot be used.
Ⓢ3+2	Maximum rate of raiseクDeltaTグ	Setting range 0~320 filtering
Ⓢ3+3	Proportional gainクKpグ	Setting range 0~32767コnote:this value is magnified 256 timesコactual value is Kp/256
Ⓢ3+4	Integral gainクKiグ	Setting range 0~32767コKiツ16384Ts/TiコTi is integral time
Ⓢ3+5	Derivative gainクKdグ	Setting time 0~32767コKd←Td/TsコTd is derivative time
Ⓢ3+6	filterクC0グ	Setting time 0~1024コintegral part filter
Ⓢ3+7	Output lower limit	Recommended setting range -2000~2000 S3+1 bit3=0 0 ヂS3+1 bit3=1-2000
Ⓢ3+8	Output upper limit	Recommended setting value 2000
Ⓢ3+9	keep	

Automatic tuning case



Error code

Controlling the setting value of parameter or the error occur on the data of PID algorithm,the algorithm error M8067 turn into ON status and save the error content D8067 into below data.

Code	error content	process state	processing method
K6705	Operand of application instruction outside of target soft element		

K6706	Operand of application instruction outside of target soft element	PID order to stop algorithm	PIs confirm the content of control data
K6730	(TS< 0) Sampling time(TS) outside of target soft element (TS< 0)		
K6732	filter(C0)outside(C0<0 or 1024↖C0)		
K6732	Maximum rate of raise(DeltaT) outside T<0 or 320↖T		
K6733	Proportional gain(KP) outside of target range		
K6734	Integral gain (KI)out side of target range(KI<0)		
K6735	Derivative gain outside of target range (KD<0)		
K6740	Sampling time↖algorithm cycle	PID order to go on operating	
K6742	Variation of measured value exceed ((PV<-32768 or 32767 < (PV)		
K6751	Direction of Self-tuning isnёt match	Self-tuning carry on	It is not match between the action direction estimated by estimated value while self-tuning start and the actual action direction while self-tuning output.pls correct the target value,self-tuning output,estimated

			value,then reself-tuning.
K7652	Self-tuning action is improper	Self-tuning	Cannot make the proper action due to the variation of estimated value of self-tuning,pls set the sampling time longer much than the output change cycle,increase the output filter constant.changes setted,then reself-tuning

Program instruction

1.PID instruction can be used multiple times and executed at the same time,but variable area of PID instruction cannot overlapヂit also can be used in step instruction,jump instruction,timer interruption,subroutine,but pls note need to delete 9 cache unit before execute PID instruction.

2.The maximum error of sampling time TS is －ク 1 execution cycle

+ l ms グ~ +ク1 execution cycleグ. If sampling time TS↖1 execution cycle OF PLC,then will have below PID operational errorクK6740グ,and execute PID algorithm as TS ツexecution cycle,in that case,it is better to use constant scanning mode or use the PID instruction in timer interrupt ク16┤┤ㄐ 18┤┤グ

PLSR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
PLSR	Pulse output with acceleration/deceleration output	16	No	PLSR (S1) (S2) (S3) (D)	7
DPLSR		32	No		17

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S3)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)		✔													

Since relays are not suitable for high frequency actions, only the transistor output type PLC is suitable to use the present instruction. The present function is represented by the pulse output instruction for fixed size transmission with acceleration/deceleration function. Where:

(S1) represents the maximum frequency of the out pulse set with a range from 10~100,000Hz;

(S2) represents the number of the output pulses set. The setting range is 110~32,767 for 16bit instructions and 110~2,147,483,647 for 32bit instructions. If the number of pulses set is less than 110, the pulses can't be output normally;

(S3) represents the acceleration/deceleration time set with a range from 50~5000 (ms). The deceleration time is the same as the acceleration and both are measured in ms. It should be noted during the setting that: (In the new version of LX series PLC deceleration time can be specified separately, refer to the introduction later)

(D) represents the pulse output port, for LX 1S only Y0 or Y1 can be specified, and Y0/Y1/Y2/Y3 for LX 2N. This port can't be repeated with the output port of the PLSY instruction.

Instruction for use:

- The instruction is executed in an interruption way, therefore it will not be influenced by the scanning cycle;

- When the instruction power flow is OFF, the deceleration stop is active; when the power flow is changed from OFF→ON, the pulse output process starts over again;

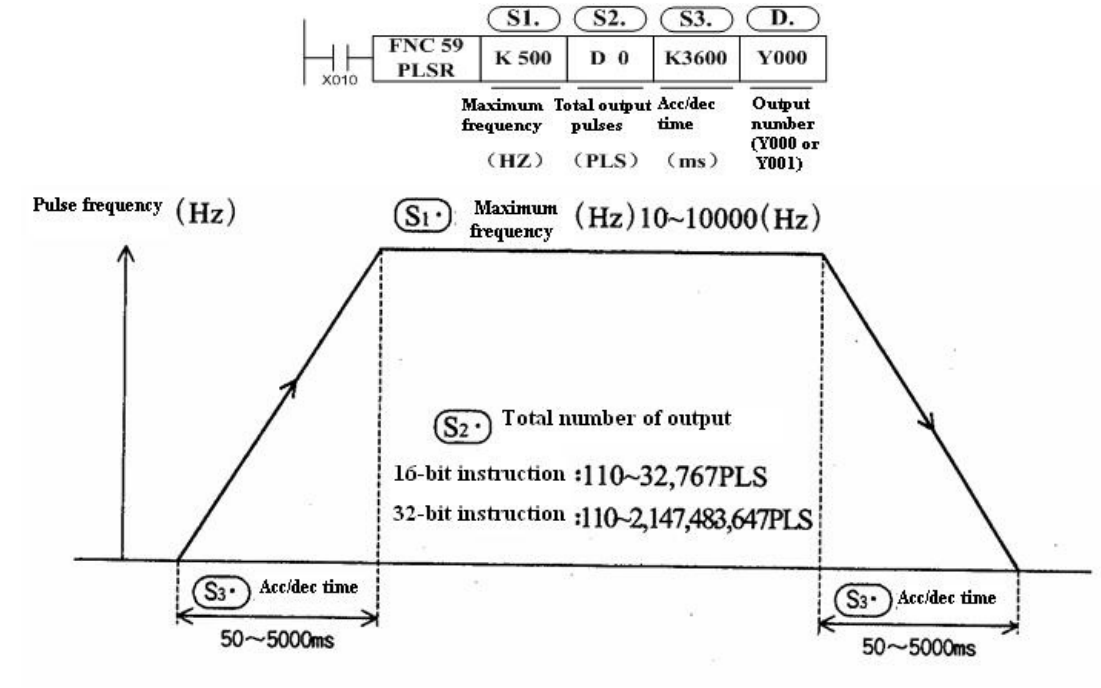
- During the pulse output process, changing of the operand will not affect the current output. The changed items will be effective the next time the instruction is executed. The M8029 sign is switched ON when the execution of the instruction is completed;

- The 40-point MT model PLC and 60-point MT model PLC can use 2 PLSR instructions and 2 PLSY instructions at the same time, corresponding to the Y0 and Y1 ports respectively. For MT model PLC with other number of points, 3 PLSR instructions or 3 PLSY instructions can be used at the same time, corresponding to the Y0, Y1, Y2 and Y3 ports. For detailed specifications refer to the hardware user's guide for programmable controller.

- The process can't be repeated with the output port number of the PWM instruction;

When starting the PLSR instruction again, a delay of 1 scanning cycle is required after the last pulseoutput operation is finished (M8147= 0 when Y0 finished; M8148=0 when Y1 is finished; M8149= 0 when Y2 is finished; M8150= 0 when Y3 is finished) before the restarting (In the new version of LX series PLC through proper configuration the limitation can be bypassed, for details please refer to the instructions in section 8.7 of the appendix);

Programming example:



The special registers corresponding to each output port are listed as follow:

Register		Definition	Remarks
D8140	Lower byte	Number of total pulses output to Y0 port set in the PLSY or PLSR instruction	Applicable instructions: use DMOV K0 D81xx to perform clear operation
D8141	Upper byte		
D8142	Lower byte	Number of total pulses output to Y1 port set in the PLSY or PLSR instruction	
D8143	Upper byte		
D8150	Lower byte	Number of total pulses output to Y2 port set in the PLSY or PLSR instruction	
D8151	Upper byte		
D8152	Lower byte	Number of total pulses output to Y3 port set in the PLSY or PLSR instruction	
D8153	Upper byte		
D8136	Lower byte	Accumulative value of the number of the pulses already output to Y0 and Y1	
D8137	Upper byte		

The output frequency range of this instruction is from 10~100,000Hz. When the high speed conversion with the maximum or accelerated/decelerated speed exceeds the range, it will be converted (ascended or descended) to a value in this range automatically before it is executed. However, the minimum frequency can actually be output is determined by the following formula:

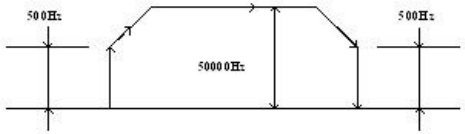
$$\sqrt{\text{Max frequency (S1)} \div (2 \times (\text{Acceleration/deceleration time (S3)} \div 1000))} = \text{Minumber of pulse output frequency}$$

The frequencies at the early stage of acceleration and at the late stage of deceleration must not be lower than the above calculation result.

[Example] Maximum speed:, Acceleration/deceleration time

$$\sqrt{50000 \div (2 \times (100 \div 1000))} = 500\text{Hz}$$

When maximum frequency S1 is specified to50000Hz, the actual output frequency at the early stage of acceleration and at the late stage of deceleration is 500Hz.



PLSV instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
PLSV	Variable	16	No	PLSV (S) (D1) (D2)	9
DPLSV	speed pulse	32	No		13
	output				

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D1)		✔													
(D2)		✔	✔	✔											

The present instruction outputs pulse frequency according to the specified port, frequency and operation direction without acceleration/deceleration. The pulse output will be stopped directly when the driving power flow is ineffective. Only the PLC with the transistor output can execute the instruction. Where:

(S) represents the specified output pulse frequency with a range from 1~32,767, -1~-32,768 Hz for 16bit instructions, and 1~200,000Hz ㄱ -1~-200,000Hz for 32bit instructions. Where the negative sign indicates instruction signals in inverse operation;

(D1) represents the pulse output port. Only Y0 or Y1 can be specified for the LX 1S, and Y0/Y1/Y2/Y3 for LX 2N;

(D2) is the operating direction output port or variant. When the output is in ON state, the system is operating in the forward direction, and vice versa.

Programming example:

The involved system variables during the execution of the present instruction:

1. D8141 (the upper byte), D8140 (the lower byte): Y000 represents the number of the output pulses decreasing when reversing. (using 32bit)
2. D8143 (the upper byte), D8142 (the lower byte): Y001 represents the number of the output pulses decreasing when reversing. (using 32bit)
3. D8151 (the upper byte), D8150 (the lower byte): Y002 represents the number of the output pulses decreasing when reversing. (using 32bit)
4. D8153 (the upper byte), D8152 (the lower byte): Y003 represents the number of the output pulses decreasing when reversing. (using 32bit)

5. M8145:Y000 represents the pulse output stopped (instantly)
6. M8146:Y001 represents the pulse output stopped (instantly)
7. M8152:Y002 represents the pulse output stopped (instantly)
8. M8153:Y003 represents the pulse output stopped (instantly)
9. M8147:Y000 represents monitoring during the pulse output process (BUSY/READY)
10. M8148:Y001 represents monitoring during the pulse output process (BUSY/READY)
11. M8149:Y002 represents monitoring during the pulse output process (BUSY/READY)
12. M8150:Y003 represents monitoring during the pulse output process (BUSY/READY)

PLSY

Command description

Name	Function	Bits	Pulse type	Command Format	Steps
PLSY	Pulse output	16	Not	PLSY (S1) (S2) (D)	7
DPLSY		32	Not		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)							✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)							✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)		✔													

Programming exampleチ

1┻Set the pulse command as the specified frequency.
(S1)チSpecified frequencyヂ
Specified rangeチ1-32767クHZグfor16-bit commandヂ1-200000クHZグfor 32-bit command┻
Modify the data of(S1) in the command to change the frequencyヂ
(S2)チThe pulse quality in commandヂ
Specified rangeチ1-32767クPLSグfor 16-bit commandヂ1-2147483647クPLSグor 32-bit command.
When its data is 0, there will not be limitation to the pulse┻
In DPLYコsetクD1,D0グas the pulse quality┻
During the command operating, reset the data of the word component in(S2) , the next command will drive to start changing.
(D)チThe pulse output port. It can refer to Y0~Y3 in LX2N;Y0~Y1 in LX1S. In order to output the high-frequency pulses in LX series, it must be the specified loading current in the output transistor of the PLC.
In the programming example, after set X0 off, the output will be interrupted. When set X0 OM, it will send the continuous pulses. Then both X0 and Y0 are OFF.
The percentage of the pulse is 50% ON, 50% OFF. When you use the interruption processing, the output control is not affected by the scanning cycle. After pulses set completely,M8029 end marker give motion.
During the commands running, the system variables are:
1. D8141クhigh bitグ コD8140クlower bitグ Y000 Output pulse quality┻Reduce when inversion┻ク32 bitsグ
2. D8143クhigh bitグコD8142クlower bitグチY001 Output pulse quality┻Reduce when inversion┻ク32 bitsグ
3. D8151クhigh bitグコD8150クlower bitグチY002 Output pulse quality┻Reduce when inversion┻ク32 bitsグ
4. D8153クhigh bitグコD8152クlower bitグチY003 Output pulse quality┻Reduce when inversion┻ク32 bitsグ
5. D8155クhigh bitグコD8154クlower bitグチY004 Output pulse quality┻Reduce when inversion┻┻ク32 bitsグ

6. M8145チY000 Stop Pulse outputクimmediatelyグ
7. M8146チY001 Stop Pulse outputクimmediatelyグ
8. M8152チY002 Stop Pulse outputクimmediatelyグ
9. M8153チY003 Stop Pulse outputクimmediatelyグ
10. M8154チY004 Stop Pulse outputクimmediatelyグ
11. M8147 チY000 Monitor during the pulse outputクBUSY/READYグ
12. M8148 チY001 Monitor during the pulse outputクBUSY/READYグ
13. M8149 チY002 Monitor during the pulse outputクBUSY/READYグ
14. M8150 チY003 Monitor during the pulse outputクBUSY/READYグ
15. M8151 チY004 Monitor during the pulse outputクBUSY/READYグ

PR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
PR	ASCII code printing	16	No	PR Ⓢ Ⓓ	5

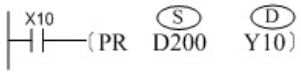
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
Ⓢ											✔	✔	✔		
Ⓓ		✔													

This instruction is used to output the values of the specified variable units byte by byte synchronously through the Y output port. Where:

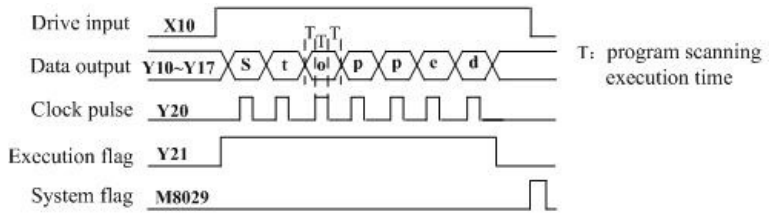
Ⓢ is the starting address of the variable units to be output;

Ⓓ is the starting number of the Y port for output print.

Programming example:



If the ASCII code in D200~D203 is "Stopped", then the corresponding output port signal and their time sequence is as follow:



Instruction for use:

The transistor output type PLC must be used to achieve the function of this instruction;

- During the printing, the printing output will be interrupted when the drive signal X10 is changed to OFF. The printing action will start again when X10 is ON;
- If M8027=OFF, the serial output for a maximum of 8 chars is possible, and 1~16 chars when M8027=ON.
- During the printing output the operation will be ended automatically when chars like "00" occur, and the subsequent text will be skipped. The finish sign M8029 will only switch ON a scanning cycle after the drive energy flow signal is ineffective;

The instruction is executed according to the scanning cycles (T in the diagram). Please use the fixed scanning mode for a short scanning period, and it can be executed in a time definite interruption program for a longer scanning period.

PRUN instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
PRUN	Transmission of octal bits	16	No	PRUN (S) (D)	5
PRUNP		16	Yes		5
DPRUN		32	No		9
DPRUNP		32	Yes		9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔		✔						
(D)								✔	✔						

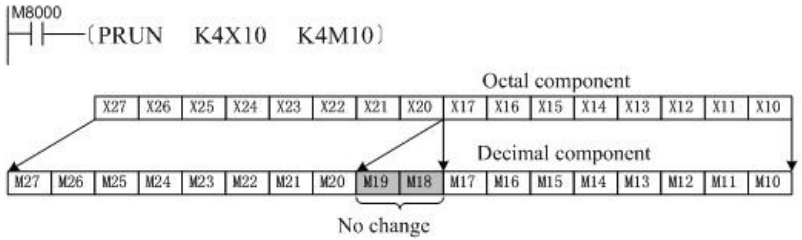
The present instruction is used to copy the bit variables (the width unit is of octal) of the continuous addresses starting with (S) to the bit variable set starting with (D) in batch. Where:

(S) is the starting address of the bit variables to be copied, where the unit digit of the addresses must be 0, such as X10, M20, etc.

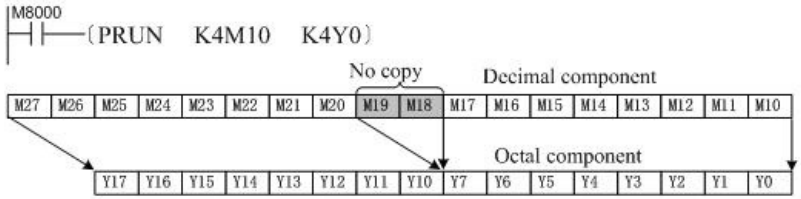
(D) is the starting address of the target bit variables. Also, the unit digit of the addresses must be 0, such as M30, Y10, etc.

Programming example:

Instruction example 1:


M8000
PRUN K4X10 K4M10
Octal component
X27 X26 X25 X24 X23 X22 X21 X20 X17 X16 X15 X14 X13 X12 X11 X10
Decimal component
M27 M26 M25 M24 M23 M22 M21 M20 M19 M18 M17 M16 M15 M14 M13 M12 M11 M10
No change

Instruction example 2:


M8000
〔PRUN K4M10 K4Y0〕
No copy
Decimal component
M27 M26 M25 M24 M23 M22 M21 M20 M19 M18 M17 M16 M15 M14 M13 M12 M11 M10
Octal component
Y17 Y16 Y15 Y14 Y13 Y12 Y11 Y10 Y7 Y6 Y5 Y4 Y3 Y2 Y1 Y0

PTO

Command description

Name	Function	Bits	Pulse Type	Command format	Step
PTO	Line Envelop Pulse Output Instruction	16	Not	PTO (S1) (S2)	5
DPTO		32	Not		9

Operand Description

Operand	Bit Component				Word Component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)													✔		
(S2)		✔													

The Operand S1 as the starting address, the data table as below:

Address Offset	Segmentation	Description
0		Segments：1~255；0 ：No pulse output；
1		Record the current segment number
2		The execution times of the enveloping table(-1: None execution 0: None limited time) Restart to enable.
——		Retain
10	#1	Initial Frequency；Range: 0~200,000；
11		Frequency incremental quantity；Signed data：-20,000~20,000；
12		The number of the pulse；1~4,294,967,295；
13	#2	Table envelope；Range: 0~200,000；
14		Frequency incremental quantity；Signed data：-20,000~20,000；
15		The number of the pulse；1~4,294,967,295；
(Continue)	#3	；Continue；

*：DPTO is 32-bit instruction whose address needs two words, So the address offset is 2.

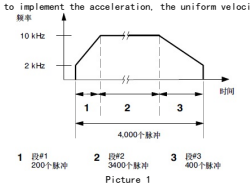
Programming example：

```
 X000          (S1)   (S2)
─┤ ├─[PTO   D0    Y000    ]
```

For example

：

PIO with pulse envelop Controls a stepper motor to implement the acceleration, the uniform velocity and deceleration or the complexed process made up of at most 255 pulses, in which every pulse has the acceleration, the uniform velocity and deceleration. The initial frequency and the final frequency are 2KHZ. The biggest frequency is 10KHZ, The 4000 pulses can come to the motor revolution excepted.



Picture 1

Picture 1 The envelop pulse will give a output single including stepper motor acceleration(first segment); stepper motor uniform velocity(second segment); stepper motor deceleration(third segment).

According to the computational formula of the frequency incremental quantity in the precautious 4, calculate the the frequency incremental quantity.

Segment 1：acceleration； Frequency incremental quantity=40；
Segment 2：uniform velocity； Frequency incremental quantity=0；
Segment 3：deceleration； Frequency incremental quantity=-20；

The enveloping table according to the command and picture 1.

Segment	Register address	Data	Description
Parameters	D0	3	All segments
	D1	0	Record the current segment number
	D2	0	The execution times of the enveloping table(-1: None execution 0: None limited time) Restart to enable.
#1	D10	2KHZ	Initial Frequency
	D11	40	Frequency incremental quantity
	D12	200	The number of the pulse
#2	D13	10KHZ	Initial Frequency
	D14	0	Frequency incremental quantity
	D15	3400	The number of the pulse
#3	D16	10KHZ	Initial Frequency
	D17	-20	Frequency incremental quantity
	D18	400	The number of the pulse

Precautions：

1、Base on the frequency, enable the instruction during the operation.

2、Frequency range：0-100kHz

3、If the enveloping table is beyond the range, the pulse will not be sent.

4、The computational formula of the frequency incremental quantity:
Frequency incremental quantity = (the final frequency of the current segment - the initial frequency of the current segment) / the number of the pulses.

5、the difference of pulse frequency interval(include inside segment and intersegment) cannot more than 20000Hz, if it exceed, the error will occur(error number 6780), the instruction will not be obeyed.

6、If the difference of adjacent pulse frequency(include inside of segment and between of segment) is more than 20khz in a PTO instruction, then the PTO Instruction cannot be executed.

(1) In the mode of circular sending, the last pulse of last segment and the first pulse of first segment is regarded as the adjacent pulse.

(2) in the mode of single sending, the last pulse of last segment is adjacent pulse.

PWM instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
PWM	Pulse band modulation	16	No	PWM (S1) (S2) (D)	7

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)		✔													

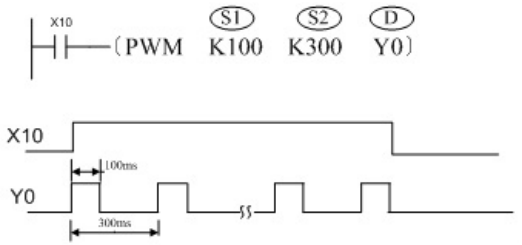
Since relays are not suitable for high frequency actions, only the transistor output type PLC is suitable to use the present instruction. This instruction outputs pulses continuously with the pulse band specified by (S1), the pulse period specified by (S2) and the port specified by (D) Where:

(S1) is the specified output pulse band, it must meet the requirement (S1) = (S2). The setting range is between 0~32,767ms;

(S2) is the specified output pulse period, it must meet the requirement (S1) = (S2). The setting range is between 0~32,767ms;

(D) is the pulse output port. Only Y0 or Y1 can be specified for the LX 1S; Y0/Y1/Y2/Y3 can be specified for LX 2N, where it must not be repeated with the output ports of PLSY and PLSR instruction. The instruction is executed in an interrupted way, the output is stopped when the instruction power flow is OFF. (S1) and (S2) can be modified when the PWM instruction is being executed.

Programming example:



RAMP instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
RAMP	Slope signal	16	No	RAMP (S1) (S2) (D) (n)	9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)													✔		
(S2)													✔		
(D)													✔		
(n)	Constant,1~32767														

This function of command is carrying on linear interpolation among two given data or appointed time sector in order to output procedure value according to the turn of scanning execution time, until sector terminal endpoint. Where:

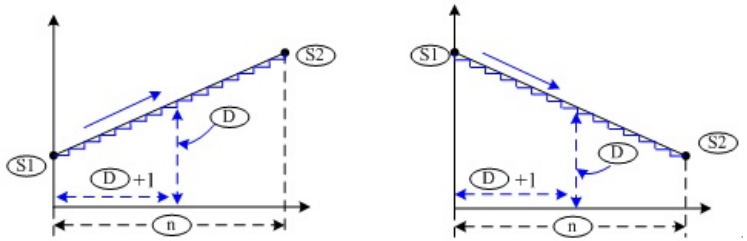
(S1) The starting value unit of slope signal

(S2) The end-point value unit of slope signal

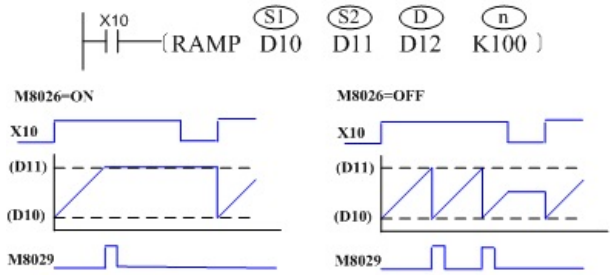
(D) The memory point for procedure value of linear interpolation signal , yet the timer which is used to count the times of interpolation is stored in unit (D)+1.

(n) The times of program scanning execution for process of interpolation .Because the output of interpolation is carried on during main loop, it's necessary to set the program execution to fixed scanning mode .(the demonstration is on M8039 ,D8039)

The interpolation calculation is based on integer number and has discarded the computation decimal. Command function is showed in the chart followed:



There are 2 modes for RAMP command execution which is selected by M8026 sign; After every interpolation, M8029 set a scanning cycle .The execution features is showed in the follow example:


X10
RAMP
S1
D10
S2
D11
D
D12
n
K100
M8026=ON
X10
(D11)
(D10)
M8029
M8026=OFF
X10
(D11)
(D10)
M8029

RCL instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
RCL	Instruction to make of 16-bit or 32-bit data left-shift with carry	16	No	RCL (D) (n)	5
RCLP		16	Yes		5
DRCL		32	No		9
DRCLP		32	Yes		9

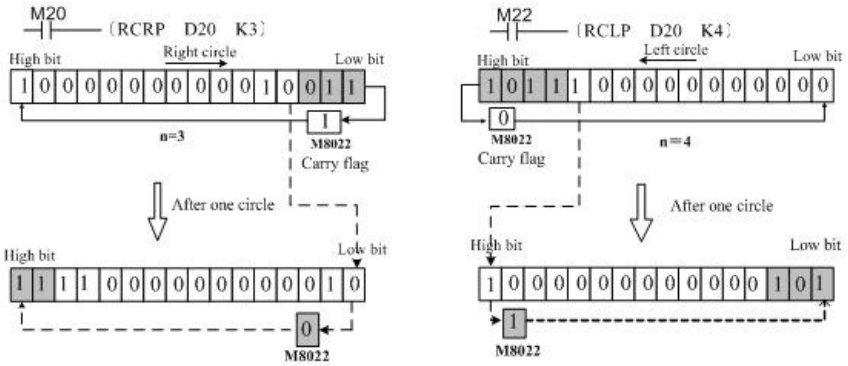
Cycle the content of (D) and carry mark shifted (n) bits to left. The instruction usually uses pulse operation type instruction.

When it is 32 bit order, rigister varialbe occupies two units neighbor address behind.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(n)	Constant,n=1~16(16bit);n=1~32(32 bit)														

If KnY, KnM or KnS is appointed in (D), only K4 (16bit) and K8(32bit) are valid.

Programming example:



RCR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
RCR	Instruction to make of 16-bit or 32-bit data right-shift with carry	16	No	RCR (D) (n)	5
RCRP		16	Yes		5
DRCR		32	No		9
DRCRP		32	Yes		9

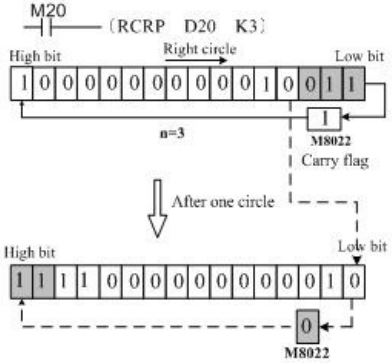
Cycle the content of (D) and carry mark shifted (n) bits to right. The instruction usually uses pulse operation type instruction.

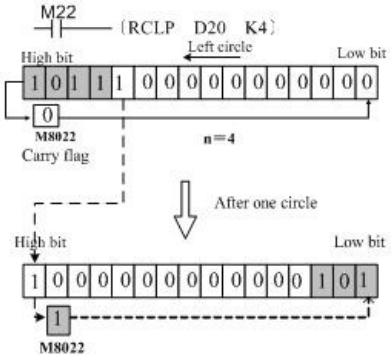
When it is 32 bit order, rigister varialbe occupies two units neighbor address behind.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(n)	Constant;n=1~16(16bit);n=1~32(32 bit)														

If KnY, KnM or KnS is appointed in (D), only K4 (16bit) and K8(32bit) are valid.

Programming example:


M20
〔RCRP D20 K3〕
High bit
Right circle
Low bit
1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1
n=3
1
M8022
Carry flag
After one circle
High bit
Low bit
1 1 1 1 0 0 0 0 0 0 0 0 0 0 1 0
0
M8022


M22
〔RCLP D20 K4〕
High bit
Left circle
Low bit
1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0
0
M8022
Carry flag
n=4
After one circle
High bit
Low bit
1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1
1
M8022

REF instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
REF	I/0 refreshing	16	No	REF (D) (n)	5
REFP		16	Yes		5

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)	✔	✔													
(n)	constant,n=8~256,it must be multiple of 8														

Update these (D) components which begin from the address of (n) immediately.

According to the property of the PLC that it accesses the ports by byte, here is some requirements:

The address of (D) shoud be the component that the lowest bit is 0 such as X0,X10,...Y0,Y10... etc..

The value of (n) must be multiple of 8.

Normally, the reading of the state of I/O is ahead of program scan each time. The refreshing of the state of output Y is batch processing after scanning over the program (to End) each time, so the I/O process has delay. If need the latest input information and hope to output the calculate result immediately, you can use the instruction REF to refresh immediately.

It can be used in the instruction FOR~NEXT,CJ, etc.

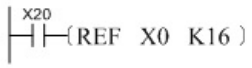
It can be used to refresh the I/O to get the latest input information and output the calculate result in intrupt subroutine immediately.

The real delay of the state change of I/O is up to the filter time of input components, X0~X7 have the function of digital filter. The time of filtering can be set in the range of 0~60ms (FNC51(instruction:REFF)). The other I/O ports are hardware filter, the filter time is about 10ms. Please refer to the details in the user manual of PLC.

The real delay of the state change of I/O is up to the response time of output conponents such as Relay. The output junction in the output refreshing will act after the response time of Output relay(Transistor). The response delay of Output relay is about 10ms(limit to20ms),The hi-speed output of Output transistor is about 10ms, general point output is ablout 0.5ms. Please refer to the details in the user manual of PLC.

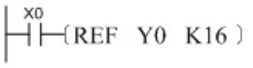
Programming example:

Example 1 for instruction:



When processing above program, if the state of X20 is ON, it will read the state of input X0~X17 immediately, updating the input information and there is no input delay.

Example 2 for instruction:



When processing above program, if the state of X0 is ON, it will refresh the state of X0~X17 immediately and update the output signal , there is no necessary to wait for the END.

REFF instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
REFF	Input refreshing (With filter setting)	16	No	REFF (n)	3
REFFP		16	Yes		3

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(n)	Constant,n=0~60,Unit:ms														

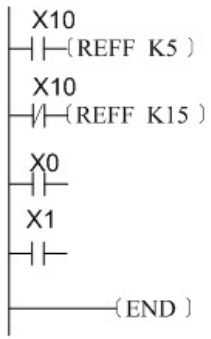
Setting the filter time constants of the X0~X7's inputs to (n).

The inputs X0~X7 use digital filter in PLC. The default filter time constants is set by D8020. You can change the value of D8020 to 0~60ms by instruction REFF. The other X ports only have RC filter in hardware. The filter time constant is about to 10ms and its modification is forbidden.

The relative ports' filter time is set to the shortest time automatically when you use the high-speed counter or the interrupting function of the input X.

You can also use MOV to assign a new value to the filter time.

Programming example:



Setting the input filter time of X0~X7 to 5ms as the state of X10 is ON, Setting the input filter time of X0~X7 to 15ms as the state of X10 is OFF.

ROL instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ROL	The instruction to make 16-bit or 32-bit data shift left	16	No	ROL (D) (n)	5
ROLP		16	Yes		5
DROL		32	No		9
DROLP		32	Yes		9

Cycle the content of (D) shifted (n) bits to left.

The instruction usually uses pulse operation type instruction.

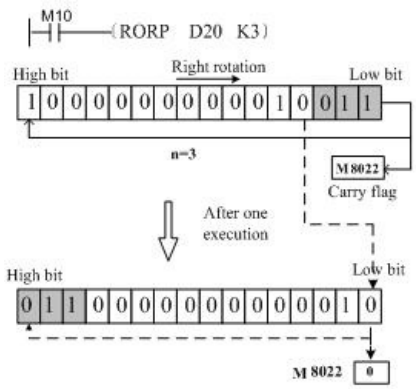
When it is 32 bit order, rigister varialbe occupies two units neighbor address behind.

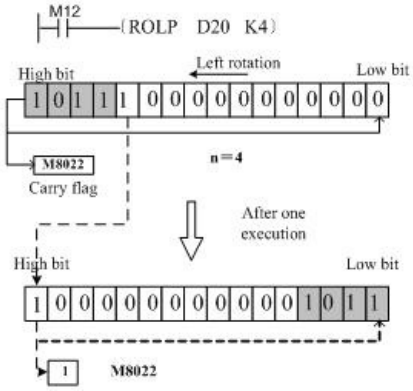
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(n)	Constant,n=1~16(16bit);n=1~32(32 bit)														

If KnY ,KnM ,KnS are specified in (D),only K4(16bit)and K8(32 bit)valid;

The final bit is circular movement into carry mark.

Programming example:


M10
(RORP D20 K3)
High bit
Right rotation
Low bit
1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1
n=3
M 8022
Carry flag
After one execution
High bit
Low bit
0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 0
M 8022
0


M12
(ROLP D20 K4)
High bit
Left rotation
Low bit
1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0
M8022
Carry flag
n=4
After one execution
High bit
Low bit
1 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1
1
M8022

ROR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ROR	The instruction to make 16-bit or 32-bit data shift right.	16	No	ROR (D) (n)	5
RORP		16	Yes		5
DROR		32	No		9
DRORP		32	Yes		9

Cycle the content of (D) and carry mark shifted (n) bits to right.

The instruction usually uses pulse operation type instruction.

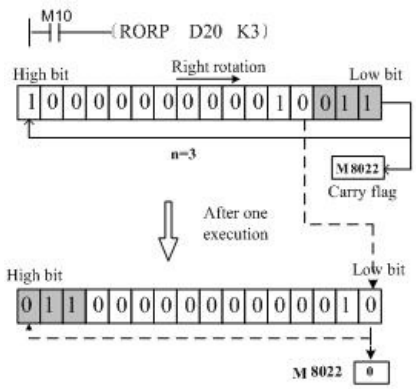
When it is 32 bit order, rigister varialbe occupies two units neighbor address behind.

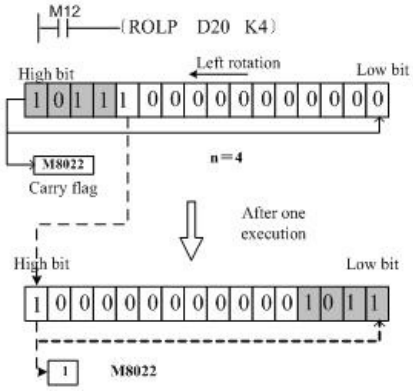
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(n)	Constant;n=1~16(16bit);n=1~32(32 bit)														

If KnY, KnM and KnS are appointed in (D) , only K4 (16bit) and K8(32bit) are valid.

The final bit is circular movement into carry mark.

Programming example:


M10
(RORP D20 K3)
High bit
Right rotation
Low bit
1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1
n=3
M 8022
Carry flag
After one execution
High bit
Low bit
0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 0
M 8022
0


M12
(ROLP D20 K4)
High bit
Left rotation
Low bit
1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0
M8022
Carry flag
n=4
After one execution
High bit
Low bit
1 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1
1
M8022

ROTC instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ROTC	Rotary workbench control	16	No	ROTC (S) (D) (m1) (m2)	9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(D)		✔	✔	✔											
(m1)	2~32767,m1≥m2														
(m2)	0~32767, m1≥m2														

This instruction is the compact instruction being used to fetch the workpiece on rotary workbench.The position detection signal of rotary workbench shall be configured by desired method to work properly. Where:

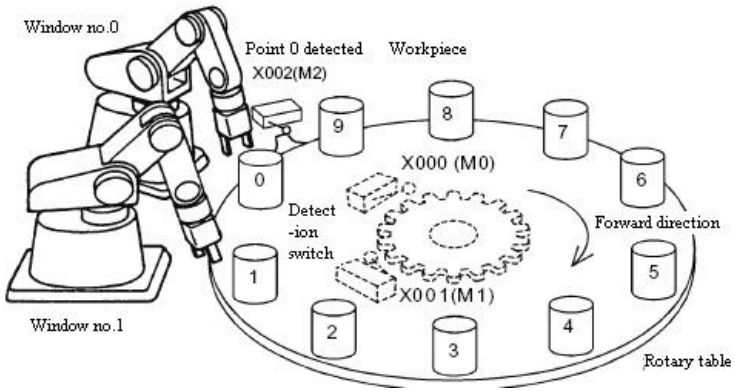
(S) The initial cell of count variable.

(m1) Numbers of station on rotary workbench, which must be (m1) ≥ (m2);

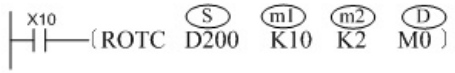
(m2) numbers of low-speed rotary workbench, which must be (m1) ≥ (m2);

(D) is the initial cell to storage position detection signal of rotary workbench, which occupies the next 8 bit variable units

Signal configuration as shown below, X0, X1 in the figure connected with the A and B phase output of AB Quadrature Encoder respectively, and we can get the Quadrature signals by mechanical switch. X2 will be used as the detection input of No.0 station ("ON" when turning to No.0 station), the rotational speed, direction, and workstation can be detected by these three signals.



Programming example:



The code actually uses the variable space as follows:

Variable	Function definition	Operation instruction
D200	Used as a counter register	These three units are pre-configured by user program
D201	Call window number setting	
D202	Call workpiece number setting	
M0	A-phase signal	Before scanning of this statement, user program will execute:
M1	B-phase signal	
M2	Point 0 detection signal	X0 (M0) X1 (M1) X2 (M2)
M3	High speed forward direction	If X10=ON, result of M3~M7 can be obtained automatically, If X10=OFF, M3~M7 are all OFF;
M4	Low speed forward direction	
M5	Stop	
M6	Low speed reversed direction	
M7	High speed reversed direction	

In the following user program，let M3~M7 go out from the Y output to control the external executive components. You can use the instruction ROTC only once in the program

RS instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
RS	Serial data transfer	16	No	RS (S) (m) (D) (n)	9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(m)					✔	✔							✔		
(D)													✔		
(n)					✔	✔							✔		

This instruction is a communication transceiver instruction. It sends the data in specified register to the serial ports automatically, and deposit the data to the designated area. This is equivalent to that the user program accesses the communication buffer directly, deals with the communication receiving and sending buffer with the user program, and achieves a custom communication protocol. Where:

(S) is the initial address of the register area where the data to be sent will be stored;

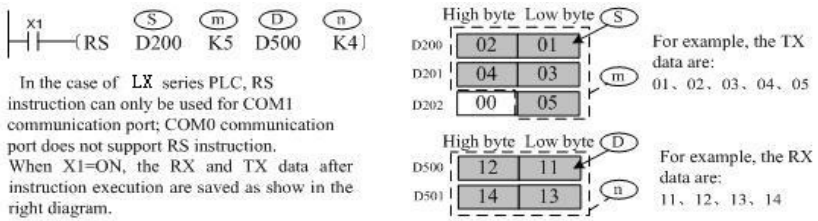
(m) is the length of the data to be sent (bytes), ranges (0~256);

(D) is the initial address of the storage register which receives communication data;

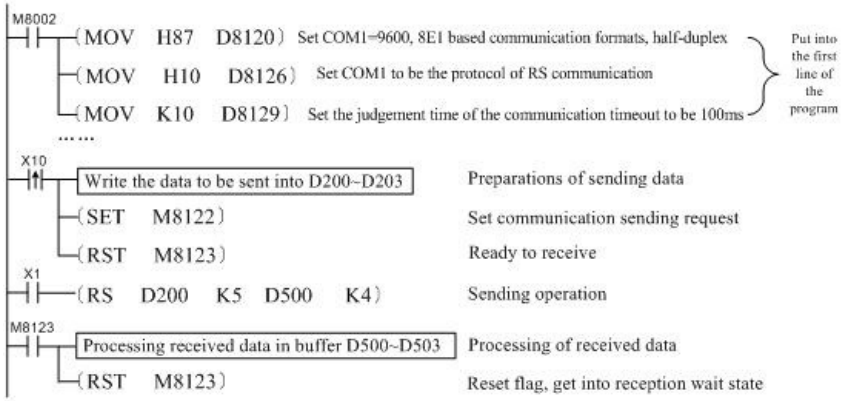
(n) is the length of the communication data received (bytes), ranges (0~256).

LX series extend function of the instruction RS. Instruction RS can realize the function of the instruction MOD when choosing MODBUS master protocol. This feature will be described later in this instruction.

Programming example:


X1
RS D200 K5 D500 K4
S
m
D
n
In the case of LX series PLC, RS instruction can only be used for COM1 communication port; COM0 communication port does not support RS instruction.
When X1=ON, the RX and TX data after instruction execution are saved as show in the right diagram.
High byte Low byte
D200 02 01
D201 04 03
D202 00 05
For example, the TX data are:
01、02、03、04、05
High byte Low byte
D500 12 11
D501 14 13
For example, the RX data are:
11、12、13、14

You need do some configuration and preparation in serial communication during the actual programming. For example, setting serial port transceiver mode, baud rate, bits, parity bit, setting the software protocol, judging the conditions of overtime, the preparation of sending and receiving buffer data, sending and receiving symbol processing and so on. Then the system can communicate as you expect. Take the last statement for example, a more complete RS communication setup as followes:


M8002
MOV H87 D8120 Set COM1=9600, 8E1 based communication formats, half-duplex
MOV H10 D8126 Set COM1 to be the protocol of RS communication
MOV K10 D8129 Set the judgement time of the communication timeout to be 100ms
Put into the first line of the program
.....
X10
Write the data to be sent into D200~D203
Preparations of sending data
SET M8122
Set communication sending request
RST M8123
Ready to receive
X1
RS D200 K5 D500 K4
Sending operation
M8123
Processing received data in buffer D500~D503
Processing of received data
RST M8123
Reset flag, get into reception wait state

SEGD instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SEGD	Seven segment decoder	16	No	SEGD (S) (D)	5
SEGDP		16	Yes		5

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

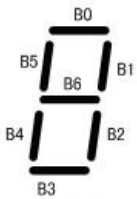
This instruction is to translate the low 4 bites of the data source into 7 segment display code, and store it into the low 8 bits of the destination variable.

(S) is the data source waiting to be translated (take the lowest 4 bits b0~b3 of BIN content);

(D) is the variable depositing the 7 yards after decoding.

Programming example:

Operations, when X20 is in the state of ON, translate the low 4 bits of the data storing in D0, and output to port Y10~Y17. The corresponding table used for translating, as follows. The users do not need to prepare the table, the PLC system has already had the check list.

Data		Nixie tube combination	nternal decoding table Value								Decoded symbol
HEX	BIN		B7	B6	B5	B4	B3	B2	B1	B0	
0	0000	 Each bit corresponds to one stroke segment 1=stroke lighted 0=stroke extinguished	0	0	1	1	1	1	1	1	0
1	0001		0	0	0	0	0	1	1	0	1
2	0010		0	1	0	1	1	0	1	1	2
3	0011		0	1	0	0	1	1	1	1	3
4	0100		0	1	1	0	0	1	1	0	4
5	0101		0	1	1	0	1	1	0	1	5
6	0110		0	1	1	1	1	1	0	1	6
7	0111		0	0	0	0	0	1	1	1	7
8	1000		0	1	1	1	1	1	1	1	8
9	1001		0	1	1	0	1	1	1	1	9
A	1010		0	1	1	1	1	0	1	1	A
B	1011		0	1	1	1	1	1	0	0	b
C	1100		0	1	1	1	1	0	0	1	C
D	1101		0	1	0	1	1	1	1	0	d
E	1110		0	1	1	1	1	0	0	1	E
F	1111		0	1	1	1	0	0	0	1	F

SEGL instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SEGL	Display of seven-segment code	16	No	SEGL (S) (D) (n)	7

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)		✔													
(n)	constant,n=0~7														

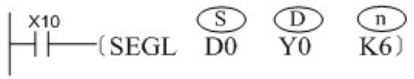
This instruction uses 8 or 12 Y ports for the display driver of the 4 or 8-bit seven-segment digital tube latch, the display mode is the scan driver mode. Where:

(S) is the data to be displayed, its value will be sent to the digital tube for display after BCD conversion.

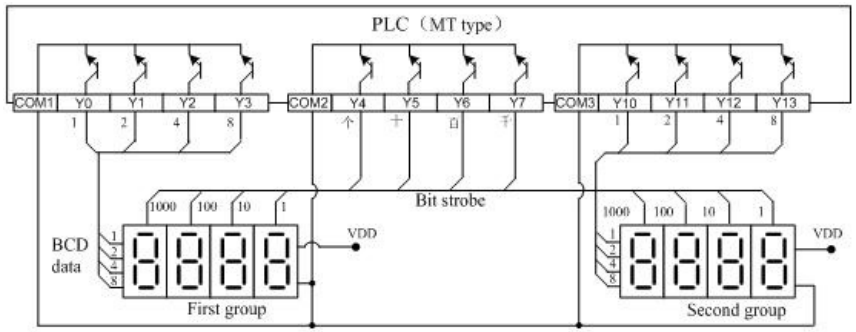
(D) is the start address number of the port used for display driver;

(n) is the settings related of the data show's group number┴signal's positive and negative logic and etc..You can see the following detailed description.

Programming example:



Corresponding hardware connection is as follows. The contents of D0 are displayed in the first group of digital tube, the contents of D1 are displayed in the second group of digital tube and the procedure operation will run error when D0 or D1's numerical reading exceeds 9999:



The digital tubes in the wiring diagram come with the data show's latch, decoding and driving of 7 segment digital tube, negative logic type (the input data is considered as 1, or strobe when input port is low) 7-segment digital display tubes. In the display processing, PLC's Y4 ~ Y7 port will automatically scan cycle and only one port is ON and as a bit strobe. In this moment, the data of Y0~Y3 port is the BCD code data sent to the corresponding bits and when bit strobe signal change from the ON → OFF, it will be latched to the latch of digital tube. The digital tubes will display the number after internal decoding and driving . PLC systems will deal with Y4 ~ Y7 cycle in turn and by the same process until all the 4 bits has been processed. Similarly, Y10 ~ Y13 is the second group data output port of 4-bit digital tubes and share Y4 ~ Y7 bit strobe line, so the process is in the same and both groups' display is processed at the same time. For the example, the first group will display 2468 and the second group will display9753whenD0=K2468,D1=K9753.

12 scan cycle is necessary to refresh one display. The flag of M8029 is set to ON after that and it need one scan cycle. The choice of (n) : according to the effects of positive and negative logic of PCL,7 segment code and so on, it can be select by following principle:

If there is one group has 4 digits, n=0~3.If there are two groups have 4 digits, n=4~7.

Group number displayed	Group 1				Group 2			
Polarity of Y data output	PNP		NPN		PNP		NPN	
Strobe and data polarity	Same	Opposite	Same	Opposite	Same	Opposite	Same	Opposite
Value of (n)	0	1	2	3	4	5	6	7

When the polarity of PLC's transistor output and the input polarity of 7 segment display is equal or not, it can match by the set-value of n.

Instruction for use:

Because Relay is not suit of higher frequency scanning output, it can be used of PLC which type is Output transistor.

SER instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SER	Data search	16	No	SER (S1) (S2) (D) (n)	7
SERP		16	Yes		7
DSER		32	No		17
DSERP		32	Yes		17

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)							✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)							✔	✔	✔	✔	✔	✔	✔	✔	✔
(n)					✔	✔							✔		
	Value range: 16bit instruction: n=1~256; 32bit instruction:n=1~128														

The instruction is to search the unit(s) with same data, maximum value and minimum value.

(S1) is the starting address of the data array:

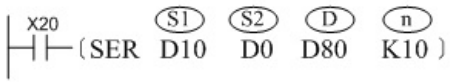
(S2) is the data, which is to be searched;

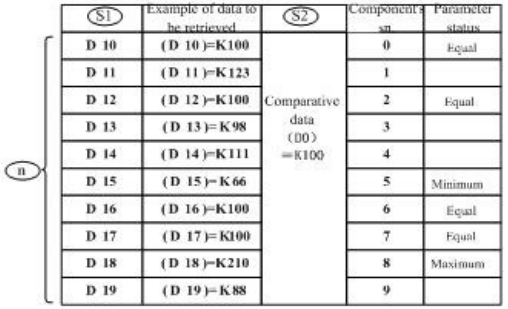
(D) is the starting address of storage range for search result;

(n) is the length of data range, which is to be searched.

When using 32bit instruction, (S1) (S2) (D) are all pointing to 32bit variable, (n) is also calculated according to 32bit variable width.

Programming example:





(S1)	Example of data to be retrieved	(S2)	Component's sn	Parameter status
D 10	(D 10)=K100	Comparative data (D0) =K100	0	Equal
D 11	(D 11)=K123		1	
D 12	(D 12)=K100		2	Equal
D 13	(D 13)=K98		3	
D 14	(D 14)=K111		4	
D 15	(D 15)=K66		5	Minimum
D 16	(D 16)=K100		6	Equal
D 17	(D 17)=K100		7	Equal
D 18	(D 18)=K210		8	Maximum
D 19	(D 19)=K88		9	

(n)

Search result

(D)	Parameter	Definition
D80	4	Number of equal paremeters
D81	0	Serial number of the first equal parameter
D82	7	Serial number of the last equal parameter
D83	5	Serial number of the minimum parameter
D84	8	Serial number of the maximum parameter

Instruction for use:

- When instruction power flow X20 is ON, the operation is implemented;
- The comparison method is signed algebra comparison, for example -8<2;
- When there are several minimum or maximum, the components with the largest serials number are displayed respectively;

The storage units for search results occupy five continue units started with (D). If there is no same data, D80~D82 in above example are all 0.

SFRD instruction

Instruction Description

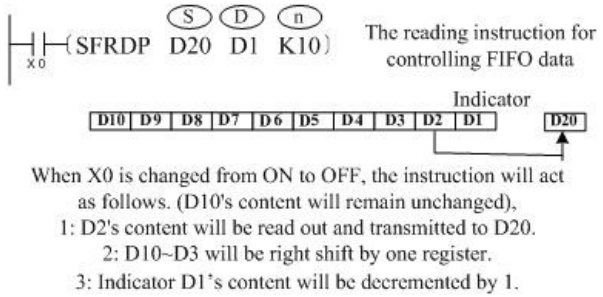
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SFRD	Shift read	16	No	SFRD (S) (D) (n)	7
SFRDP	(the reading	16	Yes		7
	instruction for controlling FIFO data)				

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		
(n)	Value range:16bit instruction:n=1~256; 32bit instruction: n=1~128														

Read the first itme in "FIFO" arrary (S) to (D) , and then implementing right shift one word for array (S) with degressive array point.The first numbered device is taken as point. When implementing instruction, the point content is subtracted by 1, and then the device value specified by S will be written to FIFO (D) data tandem location specified by point.If the point is 0, the instruction will not be processed according to above operation, and 0 flag M8020 will be set to 1.

The instruction usually uses pulse operation type instruction.

Instruction for use:


X0
SFRDP D20 D1 K10
S D n
The reading instruction for controlling FIFO data
Indicator
D10 D9 D8 D7 D6 D5 D4 D3 D2 D1
D20
When X0 is changed from ON to OFF, the instruction will act as follows. (D10's content will remain unchanged),
1: D2's content will be read out and transmitted to D20.
2: D10~D3 will be right shift by one register.
3: Indicator D1's content will be decremented by 1.

SFTL instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SFTL	Left shift	16	No	SFTL (S) (D) (n1) (n2)	7
SFTLP		16	Yes		7

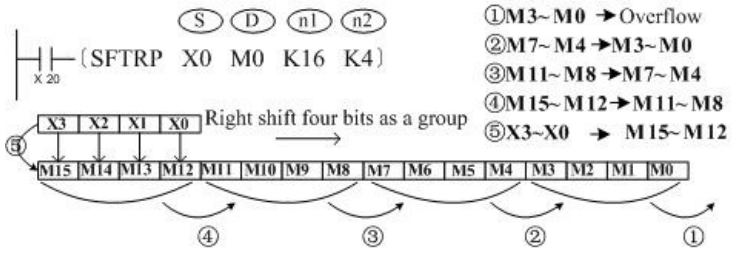
For (S) bit variables of address started with (n2) and (D) variables of address started with (n1), after left shift for (n2) bits, the result is saved in (D).

The instruction usually uses pulse operation type instruction.

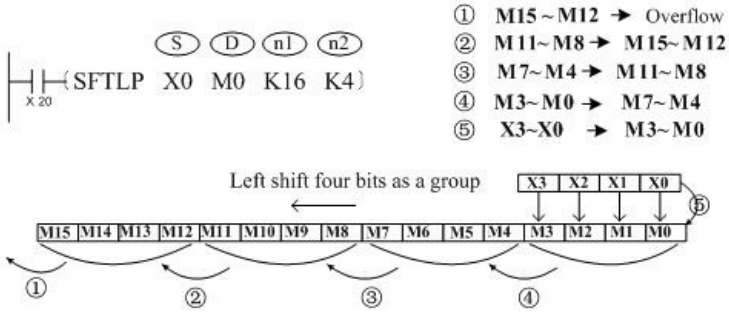
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔	✔											
(D)		✔	✔	✔											
(n1)	Constant,n1≤1024														
(n2)	Constant,n2≤n1														

Programming example:

Example 1 for instruction:


(S) (D) (n1) (n2)
X 20
SFTRP X0 M0 K16 K4
①M3~M0 → Overflow
②M7~M4 → M3~M0
③M11~M8 → M7~M4
④M15~M12 → M11~M8
⑤X3~X0 → M15~M12
X3 X2 X1 X0
Right shift four bits as a group
⑤
M15 M14 M13 M12 M11 M10 M9 M8 M7 M6 M5 M4 M3 M2 M1 M0
④ ③ ② ①

Example 2 for instruction:


S
D
n1
n2
SFTLP X0 M0 K16 K4
X 20
① M15～M12 → Overflow
② M11～M8 → M15～M12
③ M7～M4 → M11～M8
④ M3～M0 → M7～M4
⑤ X3～X0 → M3～M0
Left shift four bits as a group
X3 X2 X1 X0
M15 M14 M13 M12 M11 M10 M9 M8 M7 M6 M5 M4 M3 M2 M1 M0
①
②
③
④
⑤

SFTR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SFTR	Right shift	16	No	SFTR (S) (D) (n1) (n2)	7
SFTRP		16	Yes		7

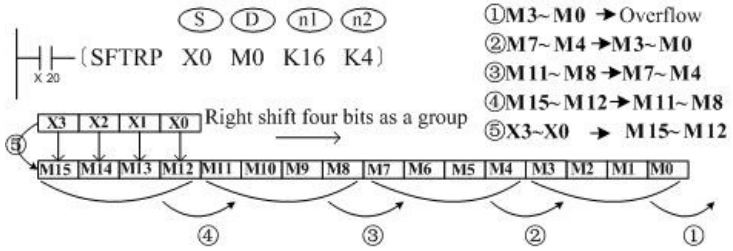
For (S) bit variables of address started with (n2) and (D) variables of address started with (n1), after left shift for (n2) bits, the result is saved in (D).

The instruction usually uses pulse operation type instruction.

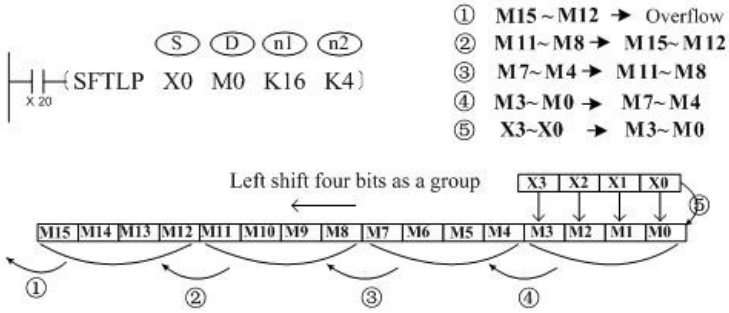
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔	✔											
(D)		✔	✔	✔											
(n1)	Constant,n1≤1024														
(n2)	Constant,n2≤n1														

Programming example:

Example 1 for instruction:


(S) (D) (n1) (n2)
X 20
SFTRP X0 M0 K16 K4
①M3~M0 → Overflow
②M7~M4 → M3~M0
③M11~M8 → M7~M4
④M15~M12 → M11~M8
⑤X3~X0 → M15~M12
X3 X2 X1 X0
Right shift four bits as a group
⑤
M15 M14 M13 M12 M11 M10 M9 M8 M7 M6 M5 M4 M3 M2 M1 M0
④ ③ ② ①

Example 2 for instruction:


S
D
n1
n2
SFTLP X0 M0 K16 K4
X 20
① M15～M12 → Overflow
② M11～M8 → M15～M12
③ M7～M4 → M11～M8
④ M3～M0 → M7～M4
⑤ X3～X0 → M3～M0
Left shift four bits as a group
X3 X2 X1 X0
M15 M14 M13 M12 M11 M10 M9 M8 M7 M6 M5 M4 M3 M2 M1 M0
①
②
③
④
⑤

SFWR instruction

Instruction Description

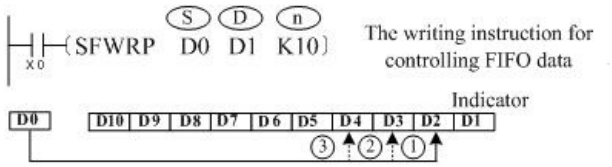
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SFWR	Shift write (the writing instruction for controlling FIFO data)	16	No	SFWR (S) (D) (n)	7
SWFRP		16	Yes		7

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		
(n)	Constant,2≤n≤2048														

Writing (S) value to the address started with (D) . In a (n) FIFO stack, the first numbered device is taken as point. When implementing instruction, the point content is added by 1, and then the device value specified by S will be written to FIFO (D) data tandem location specified by point.

The instruction usually uses pulse operation type instruction.

Programming example:



When X0=1, D0 value is saved to D2, and D1 is set to 1. When X0 is set from OFF to ON again, D0 value is saved to D3, and D1 is set to 2, and so on. If D1 value exceeds n-1, the instruction will not be implemented and carry flag M8022 will be set to 1.

SMOV instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SMOV	Bit shift	16	No	SMOV (S) (m1) (m2) (D)	11
SMOVP		16	Yes	(n)	11

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔	✔	✔
(m1)					✔	✔									
(m2)					✔	✔									
(D)								✔	✔	✔	✔	✔	✔	✔	✔
(n)					✔	✔									

The instruction is driven by contact with five operation variables, where:

(S) is the data source variable, which is to be copied;

(m1) is the starting bit number for transmitting data source with range of 1~4;

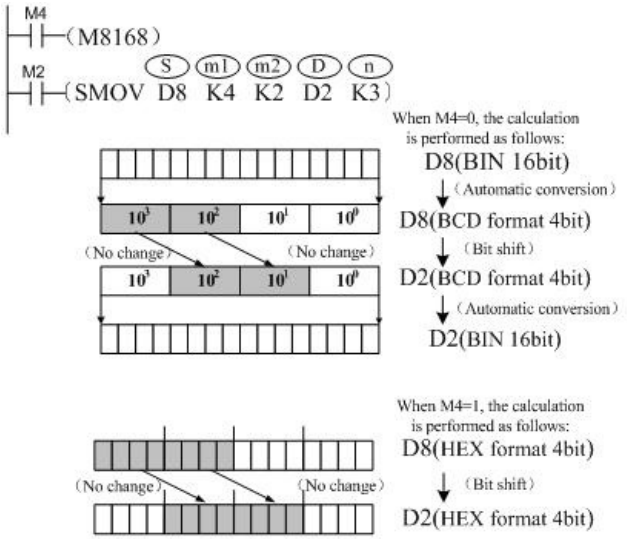
(m2) is the bit number for transmitting data source with range of 1~m1;

(D) is the target variable for transmitting data source;

(n) is the starting bit of the target variable for transmitting data source with range of m2~4.

The data bit transmission processing is related with the state of special flag M8168. When M8168 is OFF, it is in BCD mode (decimal bit); when M8168 is ON, it is in BIN mode, in which 4-bit is taken as a unit for transmission (hexadecimal bit).

Programming example:



IfD8=K1234,D2=K5678, when M8168 is OFF (BCD mode), M2 is set to ON and D2 value is K5128;

When M8168 is ON (BIN mode), D8= H04D2=K1234,D2=H162E = K5678, M2 is set to ONandD2=H104E=K4174.

SORT instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SORT	Data sorting	16	No	SORT (S) (m1) (m2) (D) (n)	17

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)													✔		
(m1)	Constant,1~32														
(m2)	Constant,1~6														
(D)													✔		
(n)					✔	✔							✔		

The instruciton is to implemnet sort operation according to (n) row parameters for a m1×m2 array, which is described by(S)(m1)(m2), and then the result is saved in variable range started with (D).

(S) is the starting unit of the first variable in first line (or called first record);

(m1) is the line number of the array, or called record number;

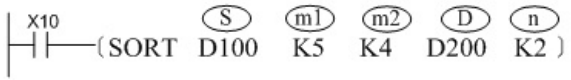
(m2) is the row number, or called item number in each record;

(D) is the starting unit for saving result, occupying following variable unit number is same as that of array before sorting;

(n) is the array row number, according which the sort operation is implemented.

(n) Where, (m2)value is within the rang of 1~(m2).

Programming example:



When X10=ON, sort operation is implemented, and after the implementation, M8029 is set to 1 (program scan period);If it needs re-sorting, X10 should be reset from OFF to ON.

Equivalent table of the above instructions and data examples:

S — m2

Col no. / Row no.	1	2	3	4
	Student no.	Chinese	Mathematics	Physics
1	D 100 1	D 105 85	D 110 78	D 115 83
2	D 101 2	D 106 82	D 111 91	D 116 81
3	D 102 3	D 107 77	D 112 89	D 117 88
4	D 103 4	D 108 90	D 113 81	D 118 75
5	D 104 5	D 109 87	D 114 95	D 119 77

m1

Data result after sorting of n =K2 according to the instruction:

D — n =K2

Col no. / Row no.	1	2	3	4
	Student no.	Chinese	Mathematics	Physics
1	D200 3	D205 77	D210 89	D215 88
2	D201 2	D206 82	D211 91	D216 81
3	D202 1	D207 85	D212 78	D217 83
4	D203 5	D208 87	D213 95	D218 77
5	D204 4	D209 90	D214 81	D219 75

Data result after sorting of n =K4 according to the instruction:

D — n =K4

Col no. / Row no.	1	2	3	4
	Student no.	chinese	Mathematics	Physics
1	D200 4	D205 90	D210 81	D215 75
2	D201 5	D206 87	D211 95	D216 77
3	D202 2	D207 82	D212 91	D217 81
4	D203 1	D208 85	D213 78	D218 83
5	D204 3	D209 77	D214 89	D219 88

SPD instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SPD	Pulse density	16	No	SPD (S1) (S2) (D)	7

The function enable flags M8100~M8105 are respectively used by X000~X005 as enable flag of enhancing function, each of which could be separately set.

(S1) The input ports of pulse signal should be X0~X5;

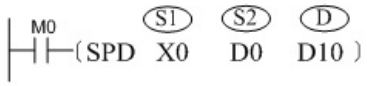
(S2) The time of detecting pulse is 1~32767(ms);

(D)+0: is the pulse number in S2, which is 16bit data.

(D)+I: The pulse number in this period.

(D)+2 :Used for detecting remain time (mS).

programming example



X0 is the input port of pulse signal;
D0 is time unit(mS);
D10 is the total pulse number in D0 peorid;
D11 is the counted data in D0 peorid;
D12 is the remain time in D0 period;

SQR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SQR	BIN radication calculation	16	No	SQR (S) (D)	5
SQRP		16	Yes		5
DSQR		32	No		9
DSQRP		32	Yes		9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)					✔	✔							✔		
(D)													✔		

The instruction is to implement BIN radication operation for (S), and the result is saved to (D).

(S) can only be specified as positive. If (S) is negative, calculation error flag M8067 will be set to ON and the operation will not be implemented, and the calculation result (D) will be round off.

Programming example:

If D0=K100, D12=K10 when X2 is ON.
If D0=K110, D12=K10 with the decimals rounded off when X2 is ON.

STMR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
STMR	Special timer	16	No	STMR (S) (m) (D)	7

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)											✔				
(m)	Constant,m=1~32767														
(S)		✔	✔	✔											

The instruction functions to create four special instructions for delay actions according to power flow. Where:

(S) Timer no.T0~T19 can be used for triggering delay action

(m) is delay setting in 100 ms ranging from K1 to K32767;

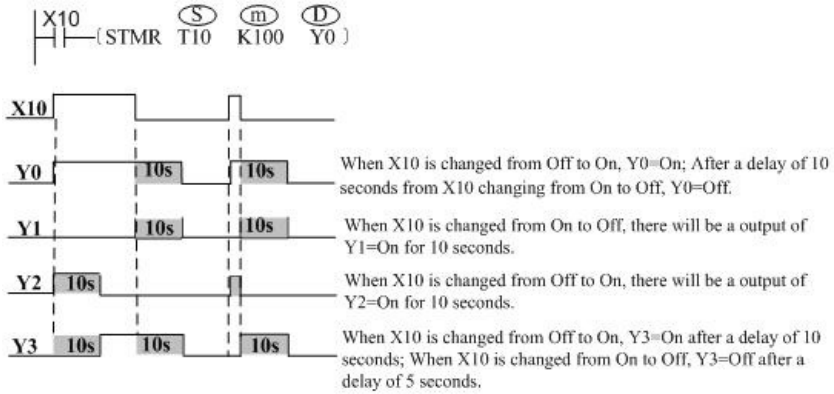
(D) is starting number for delay action outputting components and occupies 4 consecutive units.

Instruction for use:

The timer used here can't be reused in any of other instructions.

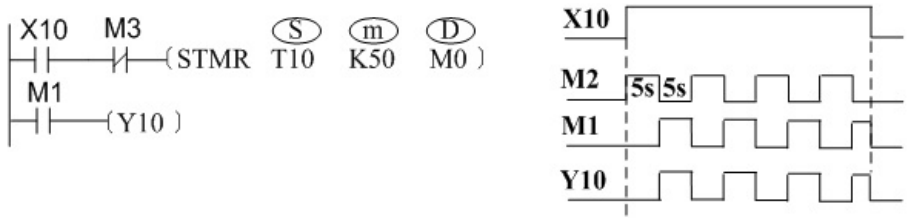
Programming example:

Example 1 for instruction:


X10
STMR T10 K100 Y0
X10
Y0
10s
10s
When X10 is changed from Off to On, Y0=On; After a delay of 10 seconds from X10 changing from On to Off, Y0=Off.
Y1
10s
10s
When X10 is changed from On to Off, there will be a output of Y1=On for 10 seconds.
Y2
10s
When X10 is changed from Off to On, there will be a output of Y2=On for 10 seconds.
Y3
10s
10s
10s
When X10 is changed from Off to On, Y3=On after a delay of 10 seconds; When X10 is changed from On to Off, Y3=Off after a delay of 5 seconds.

Example 2 for instruction:

If component of (D) is introduced in the instruction energy flow, it is easy to implement oscillator output (the function can also be implemented by using a ALT instruction), which is shown in the following figure:



SUB instruction

Instruction Description

The instruction is to implement subtract operation (A-B=C)for two values.

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SUB	BIN subtration operation	16	No	SUB (S1) (S2) (D)	7
SUBP		16	Yes		7
DSUB		32	No		13
DSUBP		32	Yes		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

The instruction is driven by contact with three operation variables. (S1) and (S2) is subtracted in BIN algebra and saved in (D). The involved variables are handled as signed number, whose highest digit is sign bit. 0 is positive number, and 1 is negative.

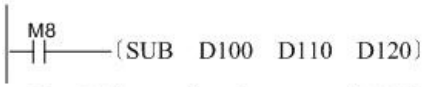
If the calculation result is 0, the 0 flag bit (M8020) will be reset;

When the calculation result exceeds 32,767 (16bit calculation) or -2,147,483,647(32bit calculation), the carry flag bit (M8021) well be reset;

When the calculation result does not exceed -32,768 (16bit calculation) or -2,147,483,648(32bit calculation), the carry flag bit (M8022) well be reset.

When using 32bit calculation, the construction variable address is a low 16bit address, and the adjoining address is a high 16bit address. It should be prevented from repeating or overwriting in the programming.

Programming example:



When M8 is set, minus the content of D100 by the content of D110 and save the result in D120; for example, if D100=K10 and D110=K8, D120=10-8=K2.

SUM instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SUM	The instruction is to count the number of instruction with "ON" in soft component	16	No	SUM (S) (D)	5
SUMP		16	Yes		5
DSUM		32	No		9
DSUMP		32	Yes		9

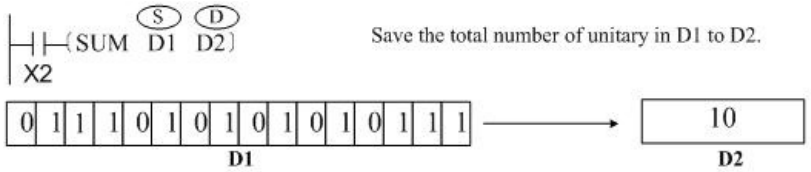
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

The instruction is to count the bit number with "1" in (S) BIN value, and the result is saved to (D).

When using DSUM and DSUMP instructions, the number of bit with "1" in 32bit((S)+1,(S))is written to (D), and (D)+1 are all set to 0.

If the bits in (S) are all 0, the zero flag bit M8020 will be set to ON.

Programming example:



SWAP instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
SWAP	Exchange higher and lower byte	16	No	SWAP (S)	3
SWAPP		16	Yes		3
DSWAP		32	No		5
DSWAPP		32	Yes		5

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔	✔	✔

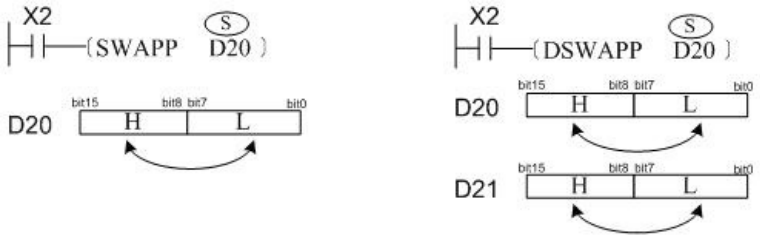
The instruction is to exchange the value between higher and lower byte of specified variable (S).

When using 16bit instruction, the exchange operation is implemented between higher 8 bits and lower 8 bits.

When using 16bit instruction, the exchange operation is implemented between higher 8 bits and lower 8 bits.

Notice: the instruction is normally applied as pulse implementation instruction, or if it is applied as continues implementation instruction, the exchange operation will be implemented every time when the program is scanned.

Programming example:



In the left figure, exchange high 8 bits and low 8 bits of D20

In the right figure, exchange high 8 bits and low 8 bits of D20,
Exchange high 8 bits and low 8 bits of D21

TADD instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TADD	Clock data addition calculation	16	No	TADD (S1) (S2) (D)	7
TADDP		16	Yes		7

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)											✔	✔	✔		
(S2)											✔	✔	✔		
(D)											✔	✔	✔		

The instruction is to implement addition calculation for two sets of clock data in hour/min/second format, and the result is saved in specified variable. Where:

(S1) is time addend occupying three continue variable units, in which hour, minute, and second data are saved in turn.

(S2) is time addend occupying three continue variable units, in which hour, minute, and second data are saved in turn.

(D) is time addition occupying three continue variable units, in which hour, minute, and second data are saved in turn.

If the calculation result exceeds 24 hours, the carry flag M8022 is set to 1 and the actual displayed time will be subtracted with 24:00:00; If the calculation result is 00:00:00, zero flag M8020 is set to 1;

Programming example:

The following operation is completed:

If the result of addition operation is higher than 24 hours, the carry flag M8022 will be set to ON.

TCMP instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TCMP	Absolute	16	No	TCMP (S1) (S2) (S3) (S) (D)	9
TCMPP	Positioning	16	Yes		9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S3)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S)											✔	✔	✔		
(D)		✔	✔	✔											

The instruction is to implement comparison between specified hour/min/second value and internal real-time clock, and output the comparison result.Where:

(S1) is the "hour" in specified comparison time with the range of 0~23;

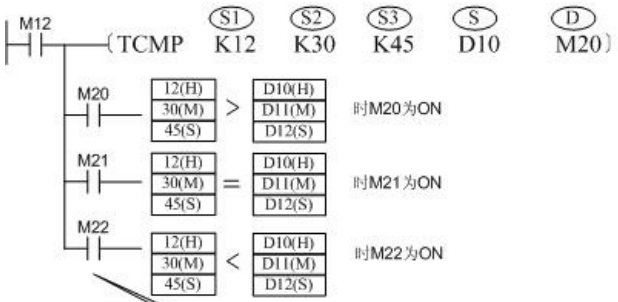
(S2) is the "minute" in specified comparison time with the range of 0~59;

(S3) is the "second" in specified comparison time with the range of 0~59;

(S) is the starting address of the real-time clock time register and normally the saving unit after clock read TRD or MOV instruction.

(D) is the starting address of storage variable for comparing result, occupying following three variable units;

Programming example:



If M12 =ON, one of M20~M22 will be set to ON.
When M12 is changed from ON to OFF, TCMP instruction will not be executed, and M20/M21/M22 will remain the state before M12=OFF. RST or ZRST can be used to clear the comparison result of M20~M22.
The result of ≥, ≤, ≠ can be obtained by series or parallel-connection of M20~M22.

TKY instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TKY	Cross key input	16	No	TKY (S) (D1) (D2)	7
DTKY		32	No		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)	✔	✔	✔	✔											
(D1)								✔	✔	✔	✔	✔	✔	✔	✔
(D2)		✔	✔	✔											

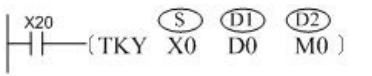
The instruction is to specify ten continuous variable units (such as X input port), which represents 0~9 key in decimal. When pressing key event occurs (the state is ON), the 4-digit decimal value (0~9999) can be inputted according to the order of pressing operation. If using 32bit instruction, the 8-digit decimal value (0~99999999) can be inputted.

(S) Is the starting input port of pressing key, occupying the following ten bit units (such as X port);

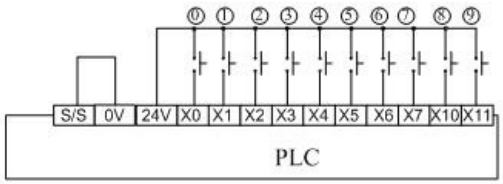
(D1) Is the storage unit for inputted value;

(D2) Is the temp starting unit for state of current pressing key group, occupying the following eleven bit units

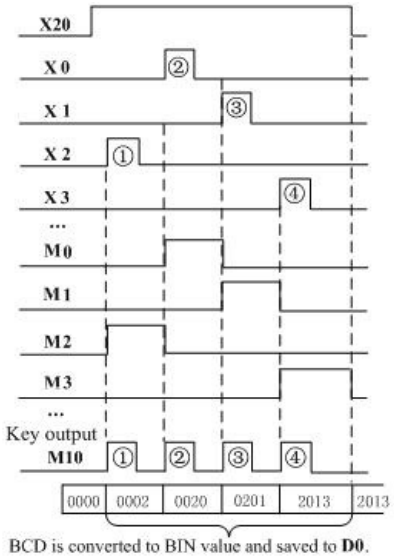
Programming example:



The corresponding hardware wiring is shown in below figure.



If you want to input "2013", just pressing key 2, 0, 1, 3 in order. The operation of PLC internal variable is shown as following figure.



Set by parameters in an instruction, X0~X11 respectively correspond to numeric keys 0~9; M0~M9 correspond to the status of keys; Key output unit will be reset whenever a key is pressed.

Key values (e.g. 2013) are converted to BIN and saved to the designated (D1) unit D; (D0=0x7DD), D0 will never change even when the power flow turns OFF.

When several keys are pressed simultaneously, the key which is firstly detected is valid; if the number entered is more than 4 digits, the first entered number will overflow and only a 4-digit number is left.

If using 32bit instruction (DTKY), and (D1) occpies 32bit variable. For the above case, they are D1, D0, whih is higher word and lower word respectively.

TO instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TO	Write BFM	16	No	TO (m1) (m2) (D) (n)	9
TOP		16	Yes		9
DTO		32	No		17
DTOP		32	Yes		17

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)								✔	✔	✔	✔	✔	✔	✔	✔
m1=0~7; m2=0~32767; n=1~32767; When (D) component is specified, K1~K4 are availabe (16bit); K1~K8 are available (32bit); m1,m2,n do not support character D register.															

The instruction is used to implement data writing operation to BFM register in specially extended module. Where:

(m1) is the address serial number of the special extended module, whose value ranges 0~7. 0 is the closest to the main module and the number goes on. Maximum of 8 special modules are allowed.

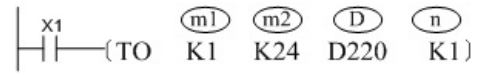
(m2) is the register address code of BFM inside the special module. It has values ranging from 0~32767;

(D) Is the parameter register address in main module, and the parameters can taken as the source of writing operation data. When the register for writing operation is more than one, the following units can be occupied;

(n) The number of written parameters with the range of 1~32767, which could be written in turn according to register address.

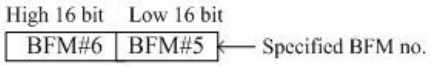
Programming example:

Example 1 for instruction:

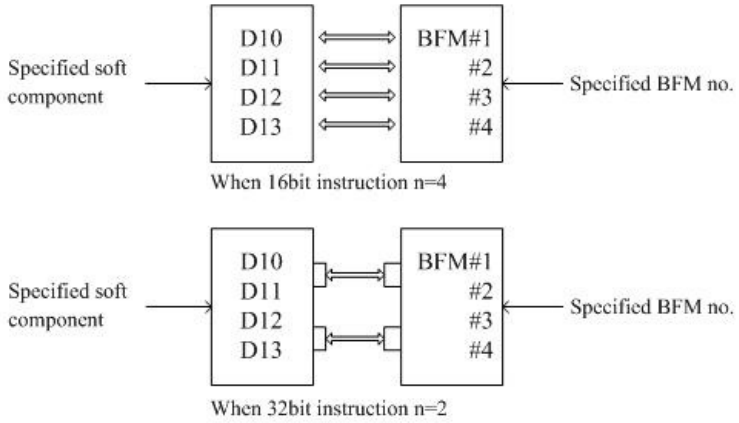


When X1 is ON, the data saved in PLC D220 register can be written to the No. 24 address in #1 special module, each for one time. When X1 is OFF, the operation will not be implemented.

When using 32bit instruction, the specified address is lower 16bit address, +1 is higher 16bit address. For example:



(n) Is the number of operating data, n=2 meaning 2 Word (16bit instruction); n=1 meaning 2 Word (32bit instruction). So please pay attention to that n=2 (16bit instruction) and n=1(32bit instruction) have the same meanings. For example:



The description of FROM/TO instruction:

1. M8164 (the changeable transmission number mode of FROM/TO instruction), When M8164=ON and implementing FROM/TO instruction, the content fo special data register D8164 (the specified transmission number register of FROM/TO instruction) will be taken as transmission number n for processing;

2. Accessing extended module with FROM/TO instruction is a time-consuming operation. When multiple FROM/TO instruments is implemented or multiple buffer memory data is transmitted, the PLC scanning period will be extended. In order to prevent overtime, you can add WDT instruction for extending monitor timer cycle before FROM/TO instruction, or stagger the operation time of FROM/TO instruction, or use pulse operational instruction.

3. For the use of connection method and input/output numbering of special module, please refer to the manual attached with them.

TRD instruction

Instruction Description

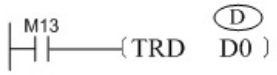
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TRD	Read clock data	16	No	TRD (D)	3
TRDP		16	Yes		3

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)											✔	✔	✔		

The instruction is to read the PLC built-in real-time clock, including year, month, day, hour, minute, second, and week, which will be saved in specified register.

where, (D) is the starting storage unit for saving read time, occupying seven continous variable units. The time data order is year, month, day, hour, minute, second, and week, which should be saved with increament order.

Programming example:



The operation is shown as following:

Item	System variables		After operation (D)
Year (0~99)	D8018	→	D0
Month (1~12)	D8017	→	D1
day (1~31)	D8016	→	D2
Hour (0~23)	D8015	→	D3
Minute (0~59)	D8014	→	D4
Second (0~59)	D8013	→	D5
Week [0 ~ 6]	D8012	→	D6

Note: normally, it is recommended to use PLC clock. Using the data in D register, which is read from clock with TDR instruction, instead of using D8012~D8018 value directly.

TSUB instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TSUB	Clock data addition calculation	16	No	TSUB (S1) (S2) (D)	7
TSUBP		16	Yes		7

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)											✔	✔	✔		
(S2)											✔	✔	✔		
(D)											✔	✔	✔		

(S1) The instruction is to implement subtraction calculation for two sets of clock data in hour/min/second format, and the result is saved in specified variable. Where:

(S2) is time minuend occupying three continue variable units, in which hour, minute, and second data are saved in turn.

(D) is time subtract result occupying three continue variable units, in which hour, minute, and second data are saved in turn.

If the calculation result is negative, the borrow flag M8021 is set to 1 and the actual displayed time will be added with 24:00:00; If the calculation result is 00:00:00, zero flag M8020 is set to 1;

Programming example:

The following operation is completed.

S1		S2		D
D10(H) 09	−	D20(H) 08	=	D40(H) 00
D11(M) 50		D21(M) 56		D41(M) 54
D12(S) 16		D22(S) 09		D42(S) 07
9:50:16		8:56:09		00:54:07

If the addition operation result is negative, then carry flag M8021 will be set to ON.

S1		S2		D
D10(H) 09	−	D20(H) 12	=	D40(H) 20
D11(M) 50		D21(M) 56		D41(M) 54
D12(S) 16		D22(S) 09		D42(S) 07
9:50:16		12:56:09		20:54:07

TTMR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TTMR	Teach timer	16	No	TTMR (D) (n)	5

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D)													✔		
(n)					✔	✔									

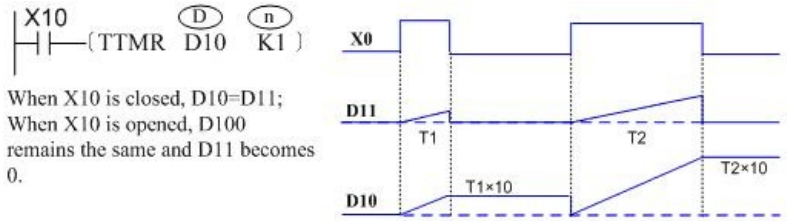
The instruction is to implement multiplication calculation for holding time of pressing specified input key and (n) , and then the result is saved to variable (D), which is usually used to set parameters. Where:

(D) is the multiplication result of holding time of pressing key in second and n, and (D) content is not changed after releasing key; (D)ゲ1 unit is used for saving holding time of pressing key in 100ms, and it will be reset to 0 after releasing key;

(n)For setting multiple, please pay attention that the actual multiple is 10n, where n=0~2.
When n=K0, the actual multiple is 1;
When n=K1, the actual multiple is 10;
When n=K2, the actual multiple is 100;

Programming example:

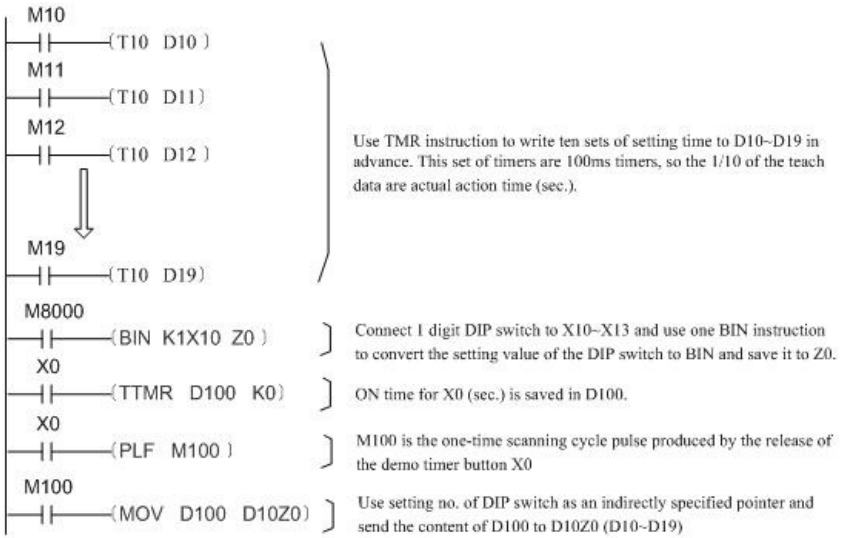
Example 1 for instruction:



If holding time of pressing key X10 is T seconds, the relationships between D10, D11, and n are listed as following:

n	D10	D11(unit: 10 ms)
K0(unit: sec)	1×T	D11=D10×10
K1(unit: 100 ms)	10×T	D11=D10
K2(unit: 10 ms)	100×T	D11=D10/10

Example 2 for instruction:


M10
(T10 D10)
M11
(T10 D11)
M12
(T10 D12)
M19
(T10 D19)
Use TMR instruction to write ten sets of setting time to D10~D19 in advance. This set of timers are 100ms timers, so the 1/10 of the teach data are actual action time (sec.).
M8000
(BIN K1X10 Z0)
Connect 1 digit DIP switch to X10~X13 and use one BIN instruction to convert the setting value of the DIP switch to BIN and save it to Z0.
X0
(TTMR D100 K0)
ON time for X0 (sec.) is saved in D100.
X0
(PLF M100)
M100 is the one-time scanning cycle pulse produced by the release of the demo timer button X0
M100
(MOV D100 D10Z0)
Use setting no. of DIP switch as an indirectly specified pointer and send the content of D100 to D10Z0 (D10~D19)

TWR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TWR	Write clock data	16	No	TWR (S)	3
TWRP		16	Yes		3

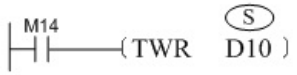
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)											✔	✔	✔		

The instruction is to write the seven data of the specified clock data (S) (including year / month / day / hours / minutes / seconds / week) into PLC built-in data of real-time clock. Where:

(S) is initial memory cell for saving reading time, and occupies seven continuous variable units. Addresses storage data in growing number: year, month, day, hour, minute, second, week, and so on.

Programming example:

Example 1 for instruction:



The operation is shown as following:

Item	Data source (D)		System variables
Year (0~99)	D0	→	D8018
Month (1~12)	D1	→	D8017
Day (1~31)	D2	→	D8016
Hour (0~23)	D3	→	D8015
Minute (0~59)	D4	→	D8014
Second (0~59)	D5	→	D8013
Week [0(day)~6]	D6	→	D8012

Note that the seven data are whole written when clock is written. Any variable can not be lacked when you preset the value. If week is not written, the default is 0 for Sunday; if month is not written, the month variable is 0, and PLC believes that the month you provide is wrong. Thus the clock change is invalid.

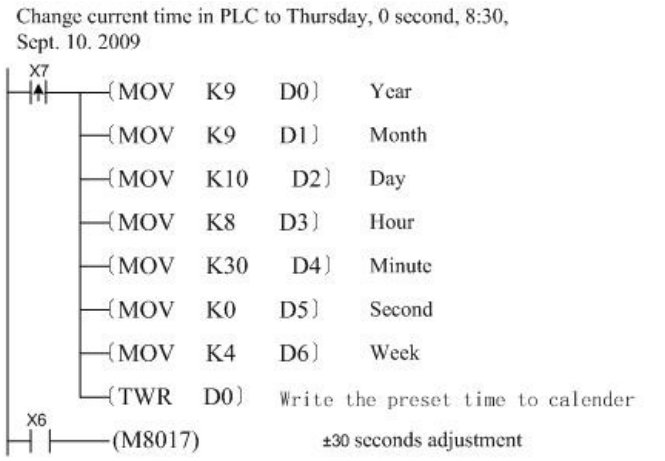
Once M8017 produce one ON, PLC internal clock does ± 30 correction action. Where the correction means that when the PLC's internal clock second hand is in 1~29, clock will be automatically classified as "0" seconds and minute hand does not act; in 30 ~9, it will also be automatically classified as "0" seconds, minutes plus 1 minute.

M8015 set ON to stop the clock timing.

In the usual case it shows only 2 digits (for example: in 2009 only show 09), If you hope that "year" shows four digits format, execute the following statements in one scan cycle:

If D8018=09 at the first time, D8018=2009 after switch. PLC internal clock is as follows.

Example 2 for instruction:


Change current time in PLC to Thursday, 0 second, 8:30,
Sept. 10. 2009
X7
MOV K9 D0 Year
MOV K9 D1 Month
MOV K10 D2 Day
MOV K8 D3 Hour
MOV K30 D4 Minute
MOV K0 D5 Second
MOV K4 D6 Week
TWR D0 Write the preset time to calender
X6
(M8017) ±30 seconds adjustment

Write the time to D0~D6 in ahead of a period of time. X7 will be turned ON to write the correct time to PLC when the actual time is due.

±30 seconds adjustment can be made as soon as M8017 is turned ON.

Note: Usually you have to modify PLC clock. Write the clock into D8013~D8019 by TWR instruction. Do not use the MOV instruction for direct assignment of the D8012~D8018.

TZCP instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
TCZP	Clock data area comparison	16	No	TZCP (S1) (S2) (S) (D)	9
TZCPP		16	Yes		9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)											✔	✔	✔		
(S2)											✔	✔	✔		
(S)											✔	✔	✔		
(D)		✔	✔	✔											

The instruction is making a comparison of built-in real-time clock data and specified two group hour / minute / second preset value range, and exports the comparison result Where:

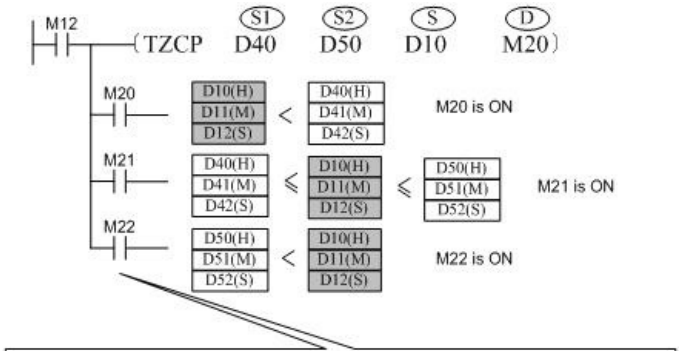
(S1) is the specified lower time limit. It occupies three continues variable units and that is hour, minute, second data.

(S2) is the specified upper time limit. It occupies three continues variable units and that is hour, minute, second data.

(S) is the starting address of the real-time clock time register and normally the saving unit after clock read TRD or MOV instruction.

(D) is the starting address of storage variable for comparing result, occupying following three variable units;

Programming example:



If M12=ON, one of M20~M22 will be turned ON.
When M12 is turned from ON to OFF, TZCP instruction will not be executed and the states in M20/M21/M22 before M12=OFF will be maintained.
RST or ZRST can be used to clear the comparison result of M20~M22.

WAND instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
WAND	Logic AND	16	No	WAND (S1) (S2) (D)	7
WANDP		16	Yes		7
DWAND		32	No		13
DWANDP		32	Yes		13

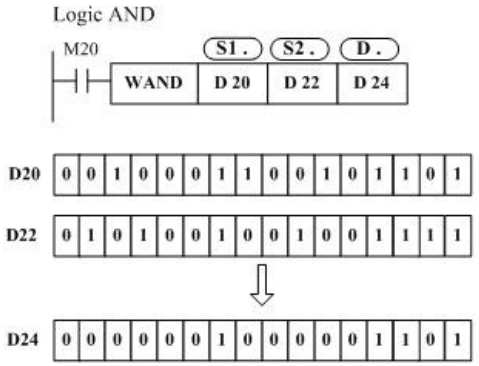
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

When the instruction runs, every BIN value digit of (S1) and (S2) use "logic and" operation. The result is stored in variable.

The ruler of "logic and" is that result is zero when anyone is zero.

1∧1=1 1∧0=0 0∧1=0 0∧0=0

Programming example:

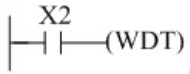


WDT instruction

Instruction Description

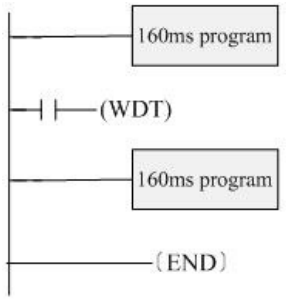
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
WDT	monitoring timer's refresh	16	No	None(needn't driver connect point's single instruction)	1
WDTP		16	Yes		1

The PLC system have a timer ,which are used to monitor whether the user's program execution time is a time-out. If time is out , the user program will stop and report alarm .Executing WDT instruction can reset monitoring timer, and makes the monitoring timer restart timing ,avoid the time-out error.



If the operation of user's program is too complex (for example, too many Cycle of calculation), an error may occur when the implementation of programming running out . If necessary, the program can use WDT instruction (for example, between the FOR ~ NEXT instruction can insert the instructions); If the program's scaning time is longer than the value of D8000 (default 200ms), we can insert program between the WDT instructions. The program will be divided into pieces ,every piece’s scaning time is less than 200ms or change the setting value of D8000.

Programming example:



This program scanning time is 320ms. we can divide program into two parts with the WDT instruction, so that each part of the program scanning time is bellow 200ms.

WOR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
WOR	Logic OR	16	No	WOR (S1) (S2) (D)	7
WORP		16	Yes		7
DOR		32	No		13
DORP		32	Yes		13

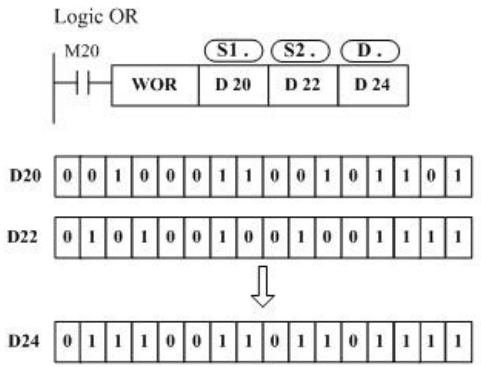
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

When the instruction runs, recognize every figure of (S1) and (S2) BIN value as "logic or" operation. The result is stored in (D) variable.

The rule of logic "or" is that the result is one when anyone is one.

1V1=1 1V0=1 0V1=1 0V0=0

Programming example:



WSFL instruction

Instruction Description

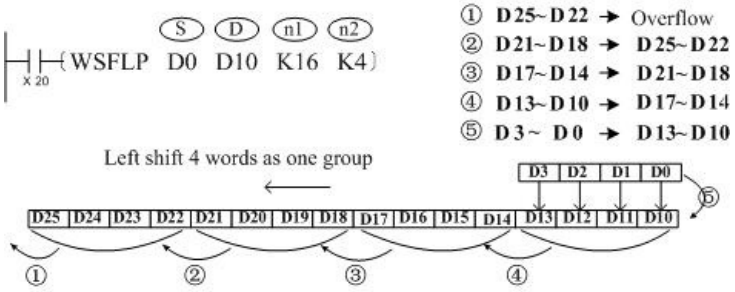
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
WSFL	Shift right by word	16	No	WSFL (S) (D) (n1) (n2)	9
WSFLP		16	Yes		9

Shift (n2) variables of (S) initiation address and (n1) variables of (D) initiation address to left (n2) words in word units..

The instruction usually uses pulse operation type instruction.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		
(n1)	Constant,n1≤2048														
(n2)	Constant,n2≤n1														

Programming example:



WSFR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
WSFR	Shift right by word	16	No	WSFR (S) (D) (n1) (n2)	9
WSFRP		16	Yes		9

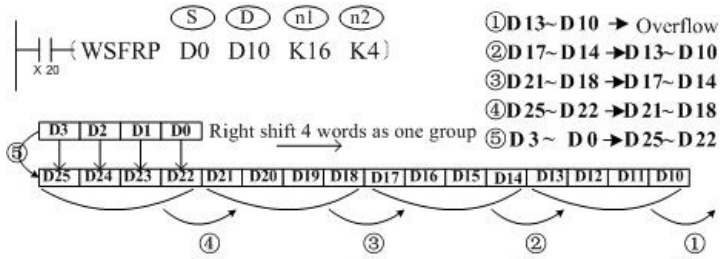
For (S) bit variables of address started with (n2) and (D) variables of address started with (n1) , after left shift for (n2) bits, the result is saved in.

The instruction usually uses pulse operation type instruction.

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)							✔	✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		
(n1)	Constant,n1≤2048														
(n2)	Constant,n2≤n1														

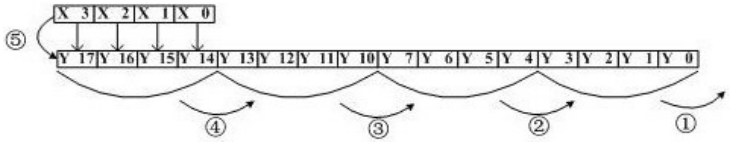
Programming example:

Example 1 for instruction:



Example 1 for instruction:

Using Kn type devices need to specify the same digits



Right shift operation in one-time scanning is performed according to the following no. 1~5.

1：Y3~Y0 → carry bit

2：Y17~Y14 → Y13~Y10

3：Y13~Y10 → Y7~Y4

4：Y7~Y4 → Y3~Y0

5：X3~X00 → Y17~Y14 Completed

WXOR instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
WXOR	Logic XOR	16	No	WXOR (S1) (S2) (D)	7
WXORP		16	Yes		7
DXOR		32	No		13
DXORP		32	Yes		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)								✔	✔	✔	✔	✔	✔	✔	✔

When the instruction runs, it will take "logic of exclusive or" operation corresponding BIN value of (S1) and (S2). The result is stored in the (D) variable.

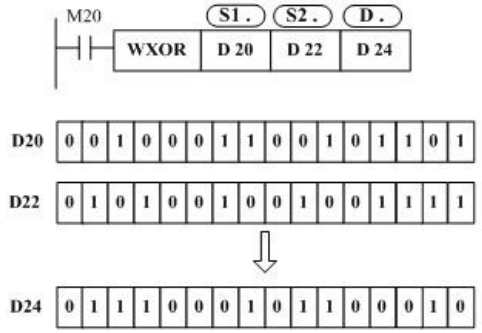
The rule of logic 'exclusive OR' (XOR) operation is 0 when the both results are same or 1 when the both results are different.

1^1= 0 1^0=1 0^1=1 0^0=0

The three instruction operands refer to the variable type as the following table. W hen the instruction is 32bit, the register variables will occupy the following two units:

Programming example:

Logic Exclusive-OR



XCH instruction

Instruction Description

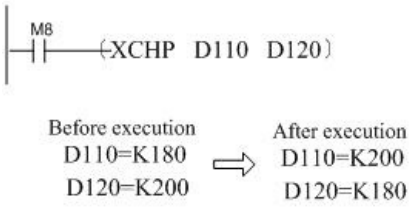
Name	Function	Bits(bits)	Pulse type	Instruction format	Step
XCH	Date exchange	16	No	XCH (S) (D)	5
XCHP		16	Yes		5
DXCH		32	No		9
DXHCP		32	Yes		9

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S)								✔	✔	✔	✔	✔	✔		
(D)								✔	✔	✔	✔	✔	✔		

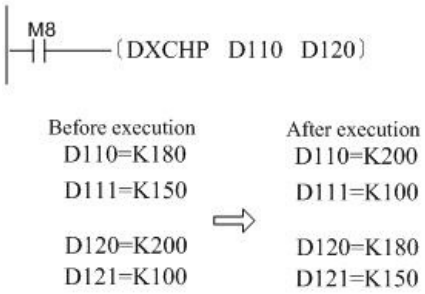
Need contact drive, there are tow operating variables. Exchange the number of (S) and (D).

Programming example:

Example 1 for instruction:



Example 2 for instruction:



When special variable M8160ヅ1,and the dress of (D) and (S) are same, the resule of opreation will be the exchange of high 8 bits and low 8 bits, 32 bits instruction is same. Equval to the SWAP instruction opreation. General realize by the swap instruction

ZCP instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ZCP	Regional comparison	16	No	ZCP (S1) (S2) (S) (D)	7
ZCPP		16	Yes		7
DZCP		32	No		13
DZCPP		32	Yes		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(D)		✔	✔	✔											

Need contact drive, there are four operating variables. When the control of power flow is effective , conduct algebraic comparison by the signed number, (S1) (S2) is interval, take (S) 's position in the interval to be the result, take the result into three contiguous variables which take (D) as the starting address. Where:

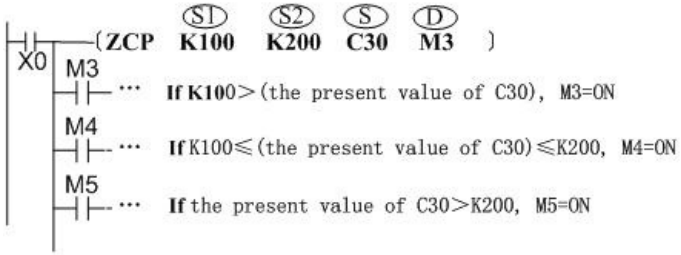
(S1) is lower limit of comparison area

(S2) is upper limit of comparison area

(S) is comparison variable

(D) is the storage cell of comparison result, it will occupy three continuous bit variables

Programming example:



If X0=ON, one of M3~M5 will become ON.
If X0 is turned from ON to OFF, ZCP instruction will not be executed and M3~M5 remain the state before X0=OFF. RST or ZRST can be used to clear the comparison result of M3~M5.

ZRN instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ZRN	Regression through the Origin	16	No	ZRN (S1) (S2) (S3) (D)	9
DZRN		32	No		13

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S3)	✔	✔	✔	✔											
(D)		✔													

When servo driver cooperates with PLC, this instruction is used to enable actuator to move toward DOG with designated impulse speed and impulse-output port, until condition of encountering original point is satisfied .

(S1) is start speed of the regression through the origin action which range is 10~32,767Hz when in 16bit modle,while 10~100,000Hz in 32bit modle.

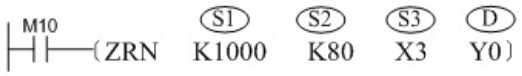
(S2) is crawling speed when original point signal turns ON which is ranging 10Hz to 32767Hz.

(S3) is input of DOG,Although signal XYMS is well,timeliness of signal X function best.

(D) is start address of impulse output.With regard to LX 1S,only Y0 and Y1 can be allocated,while others can only be allocated Y0/Y1/Y2/Y3.As to type of LX 2N.

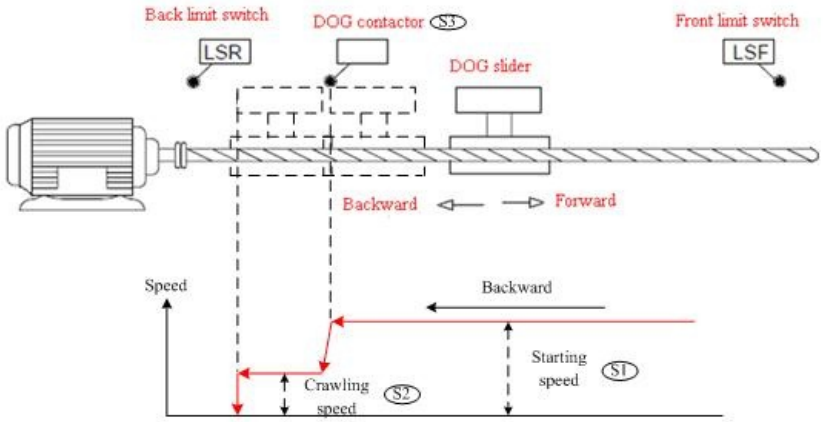
When DRVI-FNC158 and DRVA-FNCl59 are excuted,contrller can calculate pulse number of positive rotation and inversions and save them to register [D8141, D8140] (Y000) and [D8143, D8142] (Y001). But data in that register will disappear after power failure, so instruction ZRN must be executed when system is power on and initialized run, so the data of original position of mechanical movement can be read in beforehand.

Programming example:



This instruction means that, after M10 turns ON,PLC send out pulses at speed of 100Hz from out-put port Y0 making stepper motor draw back toward original point. While when DOG turns ON(when slide block just touch contactor) output frequency turns to 80Hz creeping at lower speed, until DOG turns OFF again, and at the same time Y0 stops outputing pulse, input 0 to current register Y000:[D8141,D8140],Y001:[D8143 , D8142]. In addition,when M8140 turns ON,Y0 resets. Whereafter, M8029 is set ON,at the same Y000:[M8147],Y00l:[M8148] turns OFF.

See figure below:



During this command is excuted, systemic variables concerned are:

1. D8141(high-order), D8140(low-order):Y000 outputs value of current register(using 32 bit)
2. D8143(high-order), D8142(low-order):Y001 outputs value of current register(using 32 bit)
3. M8145 : Y000 represents the pulse output stopped (instantly)
4. M8146 : Y001 represents the pulse output stopped (instantly)
5. M8147 : Y000 represents monitoring during the pulse output process (BUSY/READY)
6. M8148 :Y001 represents monitoring during the pulse output process (BUSY/READY)

Since servo driver has the function of power-fail-safeguard towards location information, this command does not need to excute after power-on every time. Meanwhile, for servo driver can only move one way, movement of backing to original point must be done before DOG..

Notice:

Positioning instruction (ZRN/PLSV/DRVI/DRVA) can be reused in the program, but do not output to the same port;

If the drive power flow for an instruction turns OFF and ON again, it can only be driven after one operation cycle when status bit (Y 000：[M8147], Y001: [M8148]) turns OFF.

When positioning instruction is driven again, there should be at least one cycle of OFF time. If the re-drive is implemented in the time less than above condition, there will be calculation error when firstly implementing calculation instruction.

ZRST instruction

Instruction Description

Name	Function	Bits(bits)	Pulse type	Instruction format	Step
ZRST	Reset all	16	No	ZRST (D1)(D2)	5
ZRSTP		16	Yes		5

Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(D1)		✔	✔	✔							✔	✔	✔		
(D2)		✔	✔	✔							✔	✔	✔		

Clear all variable between (D1) and (D2),which can be word-variable also can be bit-variable like Y\M\S.

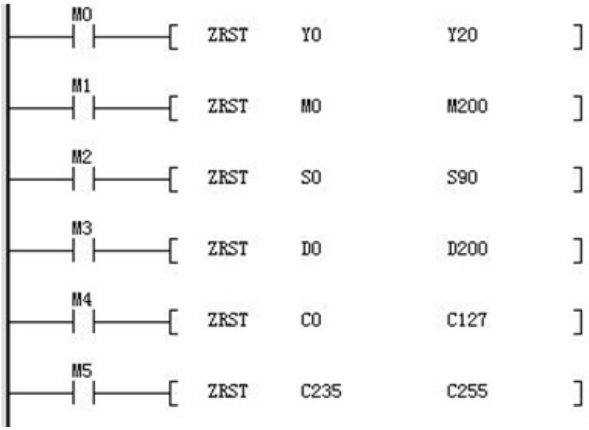
request:

(D1) and (D2) must be the same kind of soft component.

As to serial number,(D1) cannot bigger than (D2),if they are the same,just reset the prescribed soft component.

This instruction is 16bit,but (D1) and (D2) can be allocated 32 bit counters and D1 and D2 should be 16bit or 32 bit at the same time.

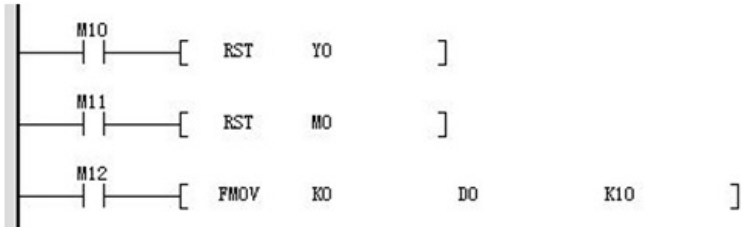
Programming example:



Additional remarks:

Device of bitY,M,S and device of word T,C,D can also be reseted by RST separately.

Device of T\C\D and device of T\C\D,including bit register KnY\KnM\KnS,can also be cleared from multi-points by FMOV Where:



AND series of contact compare instructions

Instruction Description

Name	Function	Bit(bits)	Pulse type	Instruction format	Step
AND=	(s1)=(s2) TRUE	16	No	AND☼ (S1) (S2) ☼ Comparison operators suchasin=,>,=,<=,<> etc.	5
ANDD=	(s1)=(s2)TRUE	32	No		9
AND>	(s1)>(s2)TRUE	16	No		5
ANDD>	(s1)>(s2)TRUE	32	No		9
AND<	(s1)<(s2)TRUE	16	No		5
ANDD<	(s1)<(s2)TRUE	32	No		9
AND<>	(s1)<>(s2)TRUE	16	No		5
ANDD<>	(s1)<>(s2)TRUE	32	No		9
AND<=	(s1)<=(s2)TRUE	16	No		5
ANDD<=	(s1)<=(s2)TRUE	32	No		9
AND>=	(s1)>=(s2)TRUE	16	No		5
ANDD>=	(s1)>=(s2)TRUE	32	No		9

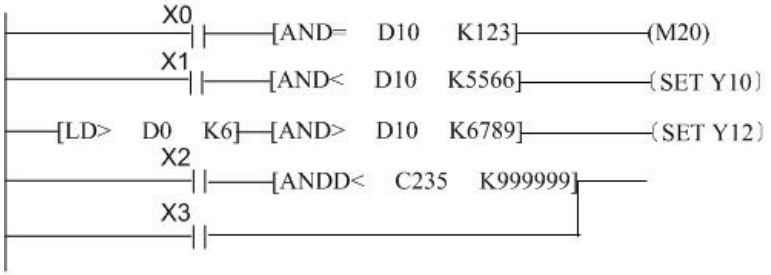
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Some other logic operations have been made before the instruction. The instruction compares two operands and makes the result participate in the operation of program energy flow in the form of logic state. All the variables used in the comparison can be regarded as signed number, among them:

(S1) is the data source or data variable unit 1 for comparison

(S2) is the data source or data variable unit 2 for comparison

The programming example



If X0=ON and the value in D10=K123, M20=ON.

If X0=ON and the value in D10 < K5566, Y10=ON and holds.

If the value in D0 > K6 and K6789, Y12=ON and holds.

If X2=ON and the value in C235 < K9999999 or X3=ON, Y15=ON and holds.

-

If the operands are two 32bits-width counters, you should use the instruction ANDD which is designed for 32bits-width-operands, otherwise an error would happen. When 32-bit counter(C200~C255) compares this instruction, be sure to use 32-bit instructions

LD series of contact compare instructions

Instruction Description

Name	Function	Bit(bits)	Pulse type	Instruction format	Step
LD=	(s1)=(s2)TRUE	16	No	LD☼ (S1) (S2) ☼ Comparisonoperatorssuchasin=,>,=,<=,<>etc.	5
LDD=	(s1)=(s2)TRUE	32	No		9
LD>	(s1)>(s2)TRUE	16	No		5
LDD>	(s1)>(s2)TRUE	32	No		9
LD<	(s1)<(s2)TRUE	16	No		5
LDD<	(s1)<(s2)TRUE	32	No		9
LD<>	(s1)<>(s2)TRUE	16	No		5
LDD<>	(s1)<>(s2)TRUE	32	No		9
LD<=	(s1)<=(s2)TRUE	16	No		5
LDD<=	(s1)<=(s2)TRUE	32	No		9
LD>=	(s1)>=(s2)TRUE	16	No		5
LDD>=	(s1)>=(s2)TRUE	32	No		9

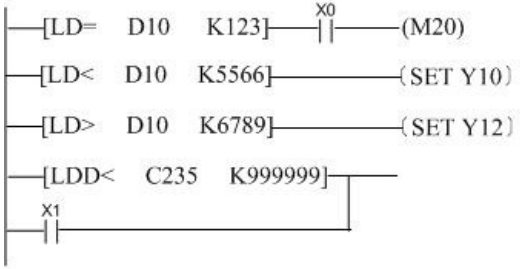
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

The instruction LD would compare one operand to another, and output a logical state as comparing result. Observe that both of the operands are singed, among them:

(S1) is the data source or data variable unit 1 for comparison

(S2) is the data source or data variable unit 2 for comparison

The programming example



If the content of D10= K123 and X0=ON, M20=ON.

If the content of D10 < K5566, Y10=ON and holds.

If the content of D10 > K6789, Y12=ON and holds.

If the content of C235 < K999999 or X1=ON, Y15=ON.

-

If the operands are two 32bits-width counters, you should use the instruction LDD which is designed for 32bits-width-operands, otherwise an error would happen. When 32-bit counter(C200~C255) compares this instruction, be sure to use 32-bit instructions

OR series of contact compare instructions

Instruction Description

Name	Function	Bit(bits)	Pulse type	Instruction format	Step
OR=	(s1)=(s2)TRUE	16	No	OR☼ (S1) (S2) ☼ Comparisonoperatorssuchasin=,>,=,<=,<>etc.	5
ORD=	(s1)=(s2)TRUE	32	No		9
OR>	(s1)>(s2)TRUE	16	No		5
ORD>	(s1)>(s2)TRUE	32	No		9
OR<	(s1)<(s2)TRUE	16	No		5
ORD<	(s1)<(s2)TRUE	32	No		9
OR<>	(s1)<>(s2)TRUE	16	No		5
ORD<>	(s1)<>(s2)TRUE	32	No		9
OR<=	(s1)<=(s2)TRUE	16	No		5
ORD<=	(s1)<=(s2)TRUE	32	No		9
OR>=	(s1)>=(s2)TRUE	16	No		5
ORD>=	(s1)>=(s2)TRUE	32	No		9

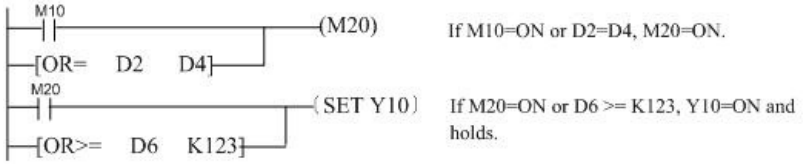
Operand	Bit component				Word component										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
(S2)					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

The instruction compares two operands and makes the result participate in the OR operation of program energy flow in the form of logic state. All the variables used in the comparison can be regarded as signed number, among them:

(S1) is the data source or data variable unit 1 for comparison

(S2) is the data source or data variable unit 2 for comparison

The programming example



If M10=ON or D2=D4, M20=ON.

If M20=ON or D6 >= K123, Y10=ON and holds.

-

For calculator which is used by numbers with a bandwidth of 32bit, ORD instruction should also be 32bit, otherwise an error would happen. When 32-bit counter(C200~C255) compares this instruction, be sure to use 32-bit instructions

Progressive Sequential Control Command

This section provides features and functions descriptions over the two progressive ladder commands: STL and RET.

STL and RET Instruction

Instruction Description

Mnemonic, Name	Function	Usable soft component	Program Step
STL	Initiation of Step Procedure	S	1
RET	End of Step Procedure	None	1

Step Control method (STL) divides controls into several operating procedures (S). Depending on the conditions in each procedure, status transitions will be carried out and complete the operation procedures progressively.

Step Control method's feature is that after taken into considerations for each control step and divided the complex procedure into successive steps, it greatly reduces the interdependence between each step and the complexity involved in programming.

Every movement executed in each status are programmed by other instructions in the ladder diagram.

STL is the initiation instruction for step procedures, and RET is the ending instruction for a step procedure. After the instruction is executed, it returns to the bus bar.

SET S[k]([k] is in decimal) is the only instruction for initiating STL transitions.

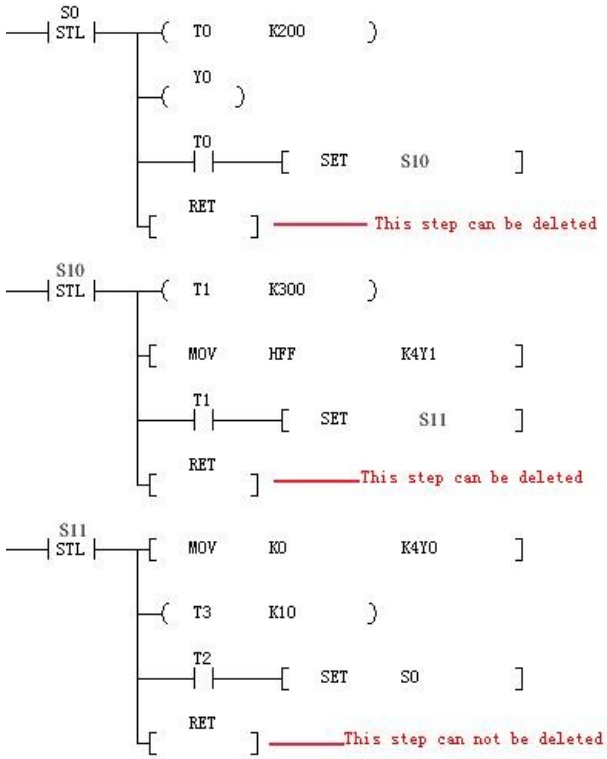
Rule: STL---RET instructions cannot be used in sub-programs.

When transition is happening from current status (S0) to next status (S1), the actions under the two scanning cycle conditions will both be executed; when the next scanning cycle is being executed, current status (S0) will be reset by the next status (S1), and the actions under the current status (S0) will not be executed. All OUT components' inputs will be interrupted.

Generally speaking, RET will be omitted between each step procedures. Therefore, it will seem a RET is shared by several STL. When STL is programmed and RET procedure is not, error message will appear.

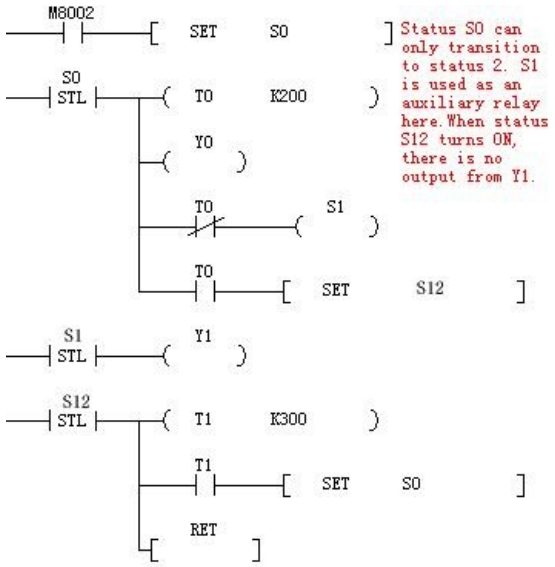
Programming Illustration:

Ladder Diagram (Illustration 1):



As illustrated above, RET is omitted between each step procedures. One RET is being shared by several STL. When STL is programmed and RET procedure is not, programming error message will appear.

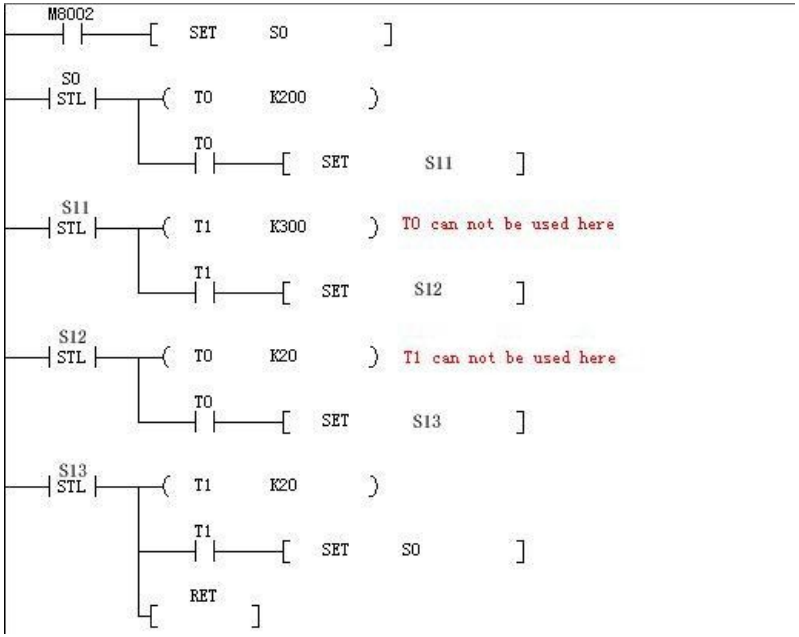
Ladder Diagram (Illustration 2):



As demonstrated in Illustration 2, only the SET instruction can be used in status transition and not the OUT instruction.

When using OUT S, S will be used as an assisting relay, instead of a status register.

Ladder Diagram (Illustration 3):



As demonstrated in Illustration 3, Time Relay T can be repeatedly used. However, the two neighboring statuses cannot use the same time relay repeatedly.

Global shortcuts

Global shortcuts as the below.

shortcuts	The corresponding menu (the function name)	essentials
Ctrl + N	new construction	new construction
Ctrl + O	open project	Open the existing project
Ctrl + S	Save project	Save project
Ctrl + X	shear	Shear data and scope of choice
Ctrl + C	Copy	Copy data and scope of choice
Ctrl + V	paste	The cursor position cut/paste copy of data
Ctrl + Z	undo	Undo the previous operation
Ctrl + Y	restore	Recovery through/cancel to cancel the operation
Ctrl + F	Search the soft components	Search the soft components
Ctrl + F1	Show/hide toolbar menu	Show/hide toolbar menu
F3	Start monitor	At present, monitoring of operation as the object of the window
Ctrl + F3	Monitor stop	At present, stop the monitoring of operation as the object of the window
F4	Transform/transform + compilation	Compiler (transform) of the current edition of program
Alt+F4	Exit the software	Exit the software

Shortcut keys of ladder diagram editor

Ladder diagram editor can use shortcut keys as the below.

keyboard shortcuts	The corresponding menu (the function name)	essentials
F5	normally open contact	The normally open contact is written to a cursor position
Shift + F5	The normally open contact OR	The normally open contact or is written to a cursor position
F6	normally closed contact	The normally closed contact is written to the cursor position
Shift + F6	The normally closed contact OR	Normally closed contact of the OR is written to a cursor position
F7	coil	The coil is written to a cursor position
F8	Application instruction	The application instructions to the cursor position
F9	Line input	To write to the cursor position.
F11	Vertical line input	The vertical line is written to a cursor position
Ctrl + F9	Line delete	Delete line from the cursor position
Ctrl + F11	vertical line delete	Delete vertical line from the cursor position
Shift + F7	Rising pulse	THE rise along of pulse is written to a cursor position
Shift + F8	Down pulse	The falling edge of pulse is written to a cursor position
Ctrl + Alt + F7	paralleling Rising pulse	The paralleling Rising pulse is written to a cursor position
Ctrl + Alt + F8	paralleling down pulse	The paralleling down pulse is written to a cursor position
Ctrl + Alt + F11	Calculation results of anti	The operation results of anti written to the cursor position
Ctrl + Shift + Insert	Insert line statement	The line statement insert to the cursor position
Shift + Insert	program for insertion	The line of program insert to the cursor position
Shift + Delete	Delete line	Delete line from the cursor position
Ctrl + Insert	Insert column	The column is inserted into the cursor position
Ctrl + Delete	Column deletion	Delete columns from the cursor position
Ctrl + →	The right direction line input / delete	From the cursor position to the right input/remove horizontal line

Ctrl + ←	The left direction of the line input / delete	From the cursor position input/remove line to the left
Ctrl + ↓	Under the direction of the vertical input / delete	From the cursor position input/remove vertical line to the down
Ctrl + ↑	The up direction of the vertical line input / delete	From the cursor position input/remove vertical line to the up
Ctrl + /	Normally open/closed contact change	change normally open/closed contact
Ctrl + G	jump	Display line of jump instruction
Ctrl + F5	comments showing	Display soft element annotation, tag annotation
Ctrl + F7	statements showing	DIsplay the statement
Ctrl + F8	Comment display	Display annotations
F1	Open the instructions help	Display the instructions help

Error code list[Error code 0000]

Applicable Machine LX series CPU

Error code(D806*) 0000

Error message NO ERROR

LED status(RUN) -

LED status(PROG.E) -

PLC ACT STATUS -

Diagnosis timing -

Error contents and causes

No trouble.

Managing method

Error code "0000" means NO ERROR.

No action is required.

Error code list[Error code 0*~1***]**

┬Applicable Machine LX series CPU

==========

┬Error code(D8060) 0***,1***

┬Error messages I/O CONFIGURATION ERROR

┬LED status(RUN) ON

┬LED status(PROG.E) OFF

┬PLC ACT STATUS RUN

┬Diagnosis timing While in RUN.

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

┬Error contents and causes

If the module or block corresponding to a programmed I/O number is not actually loaded, M8060 is set to ON and the first device number of the erroneous block is written to D8060.

For example,"020"is detected, ?1;Input X,(0;Output Y) 020;Device Number

┬Managing method

PLC continues being in RUN. If you make programming mistake, delete parts of your program using the device number.

Error code list[Error code 6101]

Applicable Machine LX series CPU

Error code(D8061) 6101

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing While in RUN.

Power is turned ON.

Error contents and causes

RAM error.

Error code list[Error code 6102]

Applicable Machine LX series CPU

Error code(D8061) 6102

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing While in RUN.

Power is turned ON.

Error contents and causes

Operation circuit error.

Error code list[Error code 6103]

Applicable Machine LX series CPU

Error code(D8061) 6103

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing While in RUN.

Power is turned ON.

Error contents and causes

I/O bus error (M8069 = ON)

Managing method

Check whether the extension cables are connected properly.

Error code list[Error code 6104]

Applicable Machine LX series CPU

Error code(D8061) 6104

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing While in RUN.

Power is turned ON.

Error contents and causes

Extension module 24V failure (M8069 = ON)

Managing method

Check whether the extension cables are connected properly.

Error code list[Error code 6105]

Applicable Machine LX series CPU

Error code(D8061) 6105

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing While in RUN.

Power is turned ON.

Error contents and causes

Watch Dog Timer error.

Managing method

Program execution time has exceeded the WDT time value set in D8000.

Check the program.

Error code list[Error code 6106]

Applicable Machine LX series CPU

Error code(D8061) 6106

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing While in RUN.

Power is turned ON.

Error contents and causes

I/O table creation error (CPU error)

Managing method

When PLC is powered ON, 24V was down in an extension unit. (It remained down for 10 seconds or more)

When PLC is powered ON, I/O allocation to CC-Link/LT (built in FX3U(C) PLC) was disabled.

Error code list[Error code 6107]

Applicable Machine LX series CPU

Error code(D8061) 6107

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing While in RUN.

Power is turned ON.

Error contents and causes

System configuration error.

Managing method

Two or more Ethernet units are connected.

Two or more Profibus-DP master units are connected.

Error code list[Error code 6113]

Applicable Machine LX series CPU

Error code(D8061) 6113

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing When installing the power of storage tape is truned ON.

Changing the settings built CC-Link/LT.

Error contents and causes

Since the protective switch is ON state⊐Storage tape installation⊐Changing the settings can not be properly built CC-Link/LT written.

Managing method

Keep storage tape protection switch is set to OFF, change the settings again.

Error code list[Error code 6114]

Applicable Machine LX series CPU

Error code(D8061) 6114

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing The power is truned ON.

Changing the settings built CC-Link/LT.

Error contents and causes

Can not be set to write to CC-Link/LT master.

Error code list[Error code 6115]

Applicable Machine LX series CPU

Error code(D8061) 6115

Error messages PLC HARDWARE ERROR

LED status(RUN) OFF

LED status(PROG.E) ON

PLC ACT STATUS STOP

Diagnosis timing The power is truned ON.

Changing the settings built CC-Link/LT.

Error contents and causes

Built CC-Link/LT master EEPROM write timeout error.

Or automatic configuration mode, you can not properly complete the configuration.

Error code list[Error code 6201]

Applicable Machine LX series CPU

Error code(D8062) 6201

Error messages PLC/PP COMMUNICATION ERROR

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a signal from PP is received.

Error contents and causes

Parity error

Overrun error

Framing error

Managing method

Check whether the programming panel(PP) and the programmable logic controller(PLC) are connected properly.

To monitor the process of plug programmable controller and connector errors may occur.

Error code list[Error code 6202]

Applicable Machine LX series CPU

Error code(D8062) 6202

Error messages PLC/PP COMMUNICATION ERROR

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a signal from PP is received.

Error contents and causes

Communication character error.

Managing method

Check whether the programming panel(PP) and the programmable logic controller(PLC) are connected properly.

To monitor the process of plug programmable controller and connector errors may occur.

Error code list[Error code 6203]

Applicable Machine LX series CPU

Error code(D8062) 6203

Error messages PLC/PP COMMUNICATION ERROR

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a signal from PP is received.

Error contents and causes

Communication data sum check error.

Managing method

Check whether the programming panel(PP) and the programmable logic controller(PLC) are connected properly.

To monitor the process of plug programmable controller and connector errors may occur.

Error code list[Error code 6204]

Applicable Machine LX series CPU

Error code(D8062) 6204

Error messages PLC/PP COMMUNICATION ERROR

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a signal from PP is received.

Error contents and causes

Data format error.

Managing method

Check whether the programming panel(PP) and the programmable logic controller(PLC) are connected properly.

To monitor the process of plug programmable controller and connector errors may occur.

Error code list[Error code 6205]

Applicable Machine LX series CPU

Error code(D8062) 6205

Error messages PLC/PP COMMUNICATION ERROR

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a signal from PP is received.

Error contents and causes

Command error.

Managing method

Check whether the programming panel(PP) and the programmable logic controller(PLC) are connected properly.

To monitor the process of plug programmable controller and connector errors may occur.

Error code list[Error code 6301]

Applicable Machine LX series CPU

Error code(D8063) 6301

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Parity error

Overrun error

Framing error

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6302]

Applicable Machine LX series CPU

Error code(D8063) 6302

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Communication character error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6303]

Applicable Machine LX series CPU

Error code(D8063) 6303

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Communication data sum check error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6304]

Applicable Machine LX series CPU

Error code(D8063) 6304

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Data format error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6305]

Applicable Machine LX series CPU

Error code(D8063) 6305

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Command error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6306]

Applicable Machine LX series CPU

Error code(D8063) 6306

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Watch dog timer error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6307]

Applicable Machine LX series CPU

Error code(D8063) 6307

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Modem initialization error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6308]

Applicable Machine LX series CPU

Error code(D8063) 6308

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Parameters of simple PLC link between error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6309]

Applicable Machine LX series CPU

Error code(D8063) 6309

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Link setup error of simple PLC.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6312]

Applicable Machine LX series CPU

Error code(D8063) 6312

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Parallel link character error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6313]

Applicable Machine LX series CPU

Error code(D8063) 6313

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Parallel link data sum check error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6314]

Applicable Machine LX series CPU

Error code(D8063) 6314

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Parallel link data format error.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6320]

Applicable Machine LX series CPU

Error code(D8063) 6320

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Communication error in Inverter communication function.

Managing method

Check the following:

Whether the power is turned ON for both PLCs.

Whether the link adapter and the PLC are connected properly.

Whether the link adapters are connected properly.

Error code list[Error code 6340]

Applicable Machine LX series CPU

Error code(D8063) 6340

Error messages SERIAL COMMUNICATION ERROR 1

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing When a mating station signal is received

Error contents and causes

Anomalous connection special adapter.

Managing method

Please confirm the connection state special adapter.

Error code list[Error code 6401]

Applicable Machine LX series CPU

Error code(D8064) 6401

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

Program sum check error.

Managing method

STOP the programmable logic controller, select the parameter mode, set the correct data.

Error code list[Error code 6402]

Applicable Machine LX series CPU

Error code(D8064) 6402

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

The capacity of a memory error.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6403]

Applicable Machine LX series CPU

Error code(D8064) 6403

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

Keep area setting error.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6404]

Applicable Machine LX series CPU

Error code(D8064) 6404

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

Note the regional settings error.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6405]

Applicable Machine LX series CPU

Error code(D8064) 6405

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

Register file region setting error.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6406]

Applicable Machine LX series CPU

Error code(D8064) 6406

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

The initial value of BFM data and inconsistent.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6407]

Applicable Machine LX series CPU

Error code(D8064) 6407

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

The initial value of BFM abnormal data.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6409]

Applicable Machine LX series CPU

Error code(D8064) 6409

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP).

When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN Setting after Power ON.

Error contents and causes

Other settings error.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6411]

Applicable Machine LX series CPU

Error code(D8064) 6411

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

Power is turned ON.

Error contents and causes

The parameter error of built CC-Link/LT settings (private area).

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6412]

Applicable Machine LX series CPU

Error code(D8064) 6412

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

Transmission parameters, STOP to RUN.

Power is turned ON.

Error contents and causes

The parameter sum of built CC-Link/LT settings (private area) is inconsistent.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6413]

Applicable Machine LX series CPU

Error code(D8064) 6413

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

Power is turned ON.

Error contents and causes

The parameter sum of built CC-Link/LT settings (private area) is inconsistent.

Managing method

Please close the PLC, and the correct parameters.

Error code list[Error code 6420]

Applicable Machine LX series CPU

Error code(D8064) 6420

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

Power is turned ON.

Error contents and causes

The sum of the special parameters is inconsistent.

Managing method

Please close the PLC, and the correct parameters.And perform the power OFF / ON operation.

Error code list[Error code 6421]

Applicable Machine LX series CPU

Error code(D8064) 6421

Error messages PARAMETER ERROR

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

Power is turned ON.

Error contents and causes

Special parameter setting error.

Managing method

Please confirm specific parameters, error codes D8489 and special adapter / block troubleshooting, special parameters are set correctly, and executive power OFF / ON operation.

Error code list[Error code 6501]

Applicable Machine LX series CPU

Error code(D8065) 6501

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Incorrect instruction / device symbol / device number combination.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6502]

Applicable Machine LX series CPU

Error code(D8065) 6502

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

No timer or counter coil before setting value.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6503]

Applicable Machine LX series CPU

Error code(D8065) 6503

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

1)No setting value following either a timer or a counter coil.

2)Insufficient number of operands for an applied instruction.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6504]

Applicable Machine LX series CPU

Error code(D8065) 6504

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

1)The same label number is used more than once.

2)The same interrupt input or high speed counter input is used more than once.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6505]

Applicable Machine LX series CPU

Error code(D8065) 6505

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Device number is outside the allowable range.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6506]

Applicable Machine LX series CPU

Error code(D8065) 6506

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Invalid applied instruction.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6507]

Applicable Machine LX series CPU

Error code(D8065) 6507

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Invalid P assignment.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6508]

Applicable Machine LX series CPU

Error code(D8065) 6508

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Invalid I assignment.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6509]

Applicable Machine LX series CPU

Error code(D8065) 6509

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Other error.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6510]

Applicable Machine LX series CPU

Error code(D8065) 6510

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

MC nesting (N) number error.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6511]

Applicable Machine LX series CPU

Error code(D8065) 6511

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

The same interrupt input or high speed counter input is used more than once.

Managing method

During programming, each instruction is checked as it is entered.

If a syntax error is detected, re-enter the instruction correctly.

Error code list[Error code 6512]

Applicable Machine LX series CPU

Error code(D8065) 6512

Error messages SYNTAX ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG-E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

EXTR(FNC180) is included in the program when function extension memory cassette is not mounted.

Managing method

FX2N(C) supports EXTR instruction. (FX3U(C) does not support.)

Error code list[Error code 6601]

Applicable Machine LX series CPU

Error code(D8066) 6601

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

LD and LDI is used continuously 9 or more times in succession.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6602]

Applicable Machine LX series CPU

Error code(D8066) 6602

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

1)No LD/LDI instruction. Unauthorized use of the LD/LDI, AND/ANI instructions.

2)The following instructions are not connected to the active bus line:

STL,RET,MCR,(P)ointer,(I)nterrupt,EI,DI,SRET,IRET,FOR,NEXT,FEND,and END.

3)When MPP is missing.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6603]

Applicable Machine LX series CPU

Error code(D8066) 6603

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

MPS is used continuously more than 12 times.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6604]

Applicable Machine LX series CPU

Error code(D8066) 6604

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Unauthorized use of the MPS/MRD/MPP instructions.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6605]

Applicable Machine LX series CPU

Error code(D8066) 6605

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

1)A single STL branch drives 9 or more parallel CIRCUITs.

2)MC/MCR or (I)nterrupts are designated within an STL state.

3)RET has not been designated or is designated out of an STL state.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6606]

Applicable Machine LX series CPU

Error code(D8066) 6606

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

1)No (P)ointer/(I)nterrupt.

2)No SRET/IRET

3)An (I)nterrupt/SRET or IRET has been designated within the main body of the program.

4)STL/RET/MC or MCR have been designated within either a subroutine or an interrupt routine.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6607]

Applicable Machine LX series CPU

Error code(D8066) 6607

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

1)Unauthorized use of FOR-NEXT 6 or more levels have been designated.

2)The following instructions have been designated within a FOR-NEXT loop:

STL/RET/MC/MCR/IRET/SRET/FEND or END.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6608]

Applicable Machine LX series CPU

Error code(D8066) 6608

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

1)Unauthorized MC/MCR relationship.

2)Missing MCR NO.

3)SRET/IRET or an (I)nterrupt has been designated within an MC/MCR block.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6609]

Applicable Machine LX series CPU

Error code(D8066) 6609

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Other ERROR.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6610]

Applicable Machine LX series CPU

Error code(D8066) 6610

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

LD and LDI is used continuously 9 or more times in succession.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6611]

Applicable Machine LX series CPU

Error code(D8066) 6611

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Number of LD/LDI instructions is fewer than ANB/ORB instructions.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6612]

Applicable Machine LX series CPU

Error code(D8066) 6612

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Number of LD/LDI instructions is more than ANB/ORB instructions.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6613]

Applicable Machine LX series CPU

Error code(D8066) 6613

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

MPS is used continuously more than 12 times.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6614]

Applicable Machine LX series CPU

Error code(D8066) 6614

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

MPS instruction missing.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6615]

Applicable Machine LX series CPU

Error code(D8066) 6615

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

MPP instruction missing.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6616]

┬Applicable Machine LX series CPU

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┬Error code(D8066) 6616

┬Error messages CIRCUIT ERROR

┬Step Number of error D8069

┬LED status(RUN) OFF

┬LED status(PROG.E) Flash

┬PLC ACT STATUS STOP

┬Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

┬Error contents and causes

Unauthorized use of the MPS/MRD/MPP instructions; possible coil missing.

┬Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6617]

Applicable Machine LX series CPU

Error code(D8066) 6617

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

One of the following instructions is not connected to the active bus line:

STL, RET, MCR, (P)ointer, (I)nterrupt, EI, DI, SRET, IRET, FOR, NEXT, FEND, and END.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6618]

Applicable Machine LX series CPU

Error code(D8066) 6618

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and cause

STL/RET/MC or MCR programmed within either a subroutine or an interrupt routine.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6619]

Applicable Machine LX series CPU

Error code(D8066) 6619

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Invalid instruction programmed within a FOR-NEXT loop:

STL/RET/MC/MCR/I/IRET/SRET.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6620]

Applicable Machine LX series CPU

Error code(D8066) 6620

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

FOR-NEXT nesting exceeded.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6621]

Applicable Machine LX series CPU

Error code(D8066) 6621

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Unmatched number of FOR and NEXT instructions.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6622]

Applicable Machine LX series CPU

Error code(D8066) 6622

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Next instruction not found.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6623]

Applicable Machine LX series CPU

Error code(D8066) 6623

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

MC instruction not found.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6624]

Applicable Machine LX series CPU

Error code(D8066) 6624

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

MCR instruction not found.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6625]

Applicable Machine LX series CPU

Error code(D8066) 6625

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

A single STL branch drives 9 or more parallel CIRCUITs.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6626]

Applicable Machine LX series CPU

Error code(D8066) 6626

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

Invalid instruction programmed within an STL-RET block:

MC/MCR/I/IRET/SRET.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6627]

Applicable Machine LX series CPU

Error code(D8066) 6627

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

RET instruction not found.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6628]

Applicable Machine LX series CPU

Error code(D8066) 6628

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

I/SRET/IRET incorrectly programmed within main program body.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6629]

Applicable Machine LX series CPU

Error code(D8066) 6629

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

P or I label not found.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6630]

Applicable Machine LX series CPU

Error code(D8066) 6630

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

SRET or IRET not found.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6631]

Applicable Machine LX series CPU

Error code(D8066) 6631

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

SRET programmed in invalid location.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6632]

Applicable Machine LX series CPU

Error code(D8066) 6632

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

FEND programmed in invalid location.

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6633]

Applicable Machine LX series CPU

Error code(D8066) 6633

Error messages CIRCUIT ERROR

Step Number of error D8069

LED status(RUN) OFF

LED status(PROG.E) Flash

PLC ACT STATUS STOP

Diagnosis timing

When program is changed(STOP). When program is transferred(STOP).

Power is turned ON.

Initial STOP to RUN setting after Power ON.

Error contents and causes

cannot find the corresponding STL instructions

Managing method

A CIRCUIT ERROR occurs if a combination of instruction is incorrect or badly specified.

Select programming mode and correct the identified ERROR.

Error code list[Error code 6701]

Applicable Machine LX series CPU

Error code(D8067) 6701

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

1) No jump destination for CJ or CALL instructions.

2) Label is undefined or out of the range P0 to P4095 by index modification.

3) Label P63 is executed by CALL instruction; P63 cannot be used in CALL instruction because P63 is for jumping to END instruction.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6702]

Applicable Machine LX series CPU

Error code(D8067) 6702

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

6 or more CALL instructions have been nested together.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6703]

Applicable Machine LX series CPU

Error code(D8067) 6703

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

3 or more interrupts have been nested together.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6704]

Applicable Machine LX series CPU

Error code(D8067) 6704

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

6 or more FOR-NEXT loops have been nested together.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6705]

Applicable Machine LX series CPU

Error code(D8067) 6705

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

An incompatible device has been specified as an operand for an applied instruction.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6706]

Applicable Machine LX series CPU

Error code(D8067) 6706

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

A device has been specified outside of the allowable range for an applied instruction operand.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6707]

Applicable Machine LX series CPU

Error code(D8067) 6707

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

A file register has been accessed which is outside of the users specified range.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6708]

Applicable Machine LX series CPU

Error code(D8067) 6708

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

FROM/TO instruction error.

Managing method

This error occurs during operation execution.

Review the program, or check the contents of operands used in applied instructions.

Make sure that the specified buffer memories exist in the counterpart equipment.

Make sure that the extension cables are connected properly.

Error code list[Error code 6709]

Applicable Machine LX series CPU

Error code(D8067) 6709

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Other error (e.g. improper branching)

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6710]

Applicable Machine LX series CPU

Error code(D8067) 6710

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Mismatch among parameters.

Managing method

For example, this error occurs when the source and the destination are same in SHIFT instruction.

Error code list[Error code 6712]

Applicable Machine LX series CPU

Error code(D8067) 6712

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

A high speed compare instruction is used more than 32 times.

Managing method

This error occurs during the execution of an operation.

When an OPERATION ERROR occurs, STOP the PLC enter programming code and correct the fault.

Note:

Operation error can occur even when the syntax or circuit design is correct, e.g. T0Z is a valid statement within an FX PLC.

But if Z had a value of 10000, the data register T10000 would be attempted to be accessed. This will cause an OPERATION ERROR as there is no T10000 device available.

Error code list[Error code 6730]

Applicable Machine LX series CPU

Error code(D8067) 6730

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Sampling time Ts (Ts < 0 or Ts > 32767).

Managing method

< Execution ceases. >

The identified parameter is specified outside of its allowable range.

Check the parameter contents.

Error code list[Error code 6732]

Applicable Machine LX series CPU

Error code(D8067) 6732

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Input filter value alpha (alpha < 0 or alpha >= 101).

Managing method

< Execution ceases. >

The identified parameter is specified outside of its allowable range.

Check the parameter contents.

Error code list[Error code 6733]

Applicable Machine LX series CPU

Error code(D8067) 6733

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Proportional gain Kp (Kp < 0 or Kp > 32767).

Managing method

< Execution ceases. >

The identified parameter is specified outside of its allowable range.

Check the parameter contents.

Error code list[Error code 6734]

Applicable Machine LX series CPU

Error code(D8067) 6734

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Integral time constant TI (TI < 0 or TI > 32767).

Managing method

< Execution ceases. >

The identified parameter is specified outside of its allowable range.

Check the parameter contents.

Error code list[Error code 6735]

Applicable Machine LX series CPU

Error code(D8067) 6735

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Derivative gain KD (KD < 0 or KD >= 201).

Managing method

< Execution ceases. >

The identified parameter is specified outside of its allowable range.

Check the parameter contents.

Error code list[Error code 6736]

Applicable Machine LX series CPU

Error code(D8067) 6736

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Derivative time constant TD (TD < 0 or TD > 32767).

Managing method

< Execution ceases. >

The identified parameter is specified outside of its allowable range.

Check the parameter contents.

Error code list[Error code 6740]

Applicable Machine LX series CPU

Error code(D8067) 6740

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Sampling time Ts is less than the program scan time.

Managing method

< Auto tuning will continue. >

The operation is continued in the condition "sampling time (Ts) = cycle time (operation cycle)".

Error code list[Error code 6742]

Applicable Machine LX series CPU

Error code(D8067) 6742

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Current value delta exceeds its limits. (delta PV < -32768 or 32767 < delta PV)

Managing method

< Execution will continue. >

Data affected resets to the nearest limit value.

This will either be a minimum of -32768 or a maximum of +32767.

Error code list[Error code 6743]

Applicable Machine LX series CPU

Error code(D8067) 6743

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Calculated error epsilon exceeds its limits.

Managing method

< Execution will continue. >

Data affected resets to the nearest limit value.

This will either be a minimum of -32768 or a maximum of +32767.

Error code list[Error code 6744]

Applicable Machine LX series CPU

Error code(D8067) 6744

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Integral result exceeds its limits.

Managing method

< Execution will continue. >

Data affected resets to the nearest limit value.

This will either be a minimum of -32768 or a maximum of +32767.

Error code list[Error code 6745]

Applicable Machine LX series CPU

Error code(D8067) 6745

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Derivative gain over, or differential value exceeds allowable range.

Managing method

< Execution will continue. >

Data affected resets to the nearest limit value.

This will either be a minimum of -32768 or a maximum of +32767.

Error code list[Error code 6746]

Applicable Machine LX series CPU

Error code(D8067) 6746

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Derivative result exceeds its limits.

Managing method

< Execution will continue. >

Data affected resets to the nearest limit value.

This will either be a minimum of -32768 or a maximum of +32767.

Error code list[Error code 6747]

Applicable Machine LX series CPU

Error code(D8067) 6747

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Total PID result exceeds its limits.

Managing method

< Execution will continue. >

Data affected resets to the nearest limit value.

This will either be a minimum of -32768 or a maximum of +32767.

Error code list[Error code 6748]

Applicable Machine LX series CPU

Error code(D8067) 6748

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

PID output upper limit set value < PID output lower limit set value.

Managing method

< PID output upper limit set value and output lower limit set value are exchanged each other. -> Execution will continue. >

Check whether the target contents are correct.

Error code list[Error code 6749]

Applicable Machine LX series CPU

Error code(D8067) 6749

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Abnormal PID input variation alarm set value or output variation alarm set value (Set value < 0)

Managing method

< Alarm output is not given. -> Execution will continue. >

Check whether the target contents are correct.

Error code list[Error code 6750]

Applicable Machine LX series CPU

Error code(D8067) 6750

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Step response method >

Improper auto tuning

Managing method

< Auto tuning is finished. -> PID operation is started. >

The difference between the measured value(when auto tuning was started) and the target value was 150 or less.

The difference between the measured value(when auto tuning was started) and the target value was 1/3 or more.

Check the measured value and the target value, and then execute auto tuning again.

Error code list[Error code 6751]

Applicable Machine LX series CPU

Error code(D8067) 6751

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Step response method >

Auto tuning operation direction mismatc

Managing method

< Auto tuning is forcibly finished. -> PID operation is not started. >

The operation direction estimated form the measured value at start of auto tuning was different from the actual operation direction of the output during auto tuning.

Correct the relationship among the target value, output value for auto tuning and measured value, and then execute auto tuning again.

Error code list[Error code 6752]

Applicable Machine LX series CPU

Error code(D8067) 6752

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Step response method >

Improper auto tuning operatio

Managing method

< Auto tuning is finished. -> PID operation is not started. >

Because the set value was fluctuated during auto tuning, auto tuning was not correctly executed.

Set the sampling time to a value larger than the output change cycle, or set a larger value to the input filter constant.

After changing the setting, execute auto tuning again.

Error code list[Error code 6753]

Applicable Machine LX series CPU

Error code(D8067) 6753

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Limit cycle method >

Abnormal output set value for auto tuning

[ULV(upper limit) <= LLV(lower limit)

Managing method

< Auto tuning is forcibly finished. -> PID operation is not started. >

Check whether the target contents are correct.

Error code list[Error code 6754]

Applicable Machine LX series CPU

Error code(D8067) 6754

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Limit cycle method >

Abnormal PV threshold (hysteresis) set value for auto tuning

(SHpv < 0)

Managing method

< Auto tuning is forcibly finished. -> PID operation is not started. >

Check whether the target contents are correct.

Error code list[Error code 6755]

Applicable Machine LX series CPU

Error code(D8067) 6755

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Limit cycle method >

Abnormal auto tuning transfer status

(Data of device controlling transfer status is abnormally overwritten)

Managing method

< Auto tuning is forcibly finished. -> PID operation is not started. >

Check whether devices occupied by the PID instruction are not overwritten in the program.

Error code list[Error code 6756]

Applicable Machine LX series CPU

Error code(D8067) 6756

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Limit cycle method >

Abnormal result due to excessive auto tuning measurement time

(Tau on > Tau , Tau on < 0 , Tau < 0)

Managing method

< Auto tuning is forcibly finished. -> PID operation is not started. >

The auto tuning time is too long.

Increase the difference(ULV-LLV) between the upper limit and the lower limit of the output value for auto tuning, set a smaller value to the input filter constant(Alpha), or set a smaller value to the PV threshold(SHpv) for auto tuning, and then check whether the result is improved.

Error code list[Error code 6757]

Applicable Machine LX series CPU

Error code(D8067) 6757

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Limit cycle method >

Auto tuning result exceeds proportional gain.

(KP < 0 or KP > 32767)

Managing method

< Auto tuning is finished (KP = 32767). -> PID operation is started. >

The variation of measurement value (PV) is small against the output value. Increase the variation of the measured value during auto tuning.

Error code list[Error code 6758]

Applicable Machine LX series CPU

Error code(D8067) 6758

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Limit cycle method >

Auto tuning result exceeds integral time.

(TI < 0 or TI > 32767)

Managing method

< Auto tuning is finished (TI = 32767). -> PID operation is started. >

The auto tuning time is too long. Increase the difference (ULV-LLV) between the upper limit and the lower limit of the output value for auto tuning, set a smaller value to the input filter constant (Alpha), or set a smaller value to the PV threshold (SHpv) for auto tuning, and then check whether the result is improved.

Error code list[Error code 6759]

Applicable Machine LX series CPU

Error code(D8067) 6759

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

< Limit cycle method >

Auto tuning result exceeds differential time.

(TD < 0 or TD > 32767)

Managing method

< Auto tuning is finished (TD = 32767). -> PID operation is started. >

The auto tuning time is too long. Increase the difference (ULV-LLV) between the upper limit and the lower limit of the output value for auto tuning, set a smaller value to the input filter constant (Alpha), or set a smaller value to the PV threshold (SHpv) for auto tuning, and then check whether the result is improved.

Error code list[Error code 6760]

Applicable Machine LX series CPU

Error code(D8067) 6760

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

ABS data read from servo sum check error.

Managing method

Check the connection to the servo, and check the setting.

Error code list[Error code 6762]

Applicable Machine LX series CPU

Error code(D8067) 6762

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Port specified by inverter communication instruction is already used in another communication.

Managing method

Check whether the port is not specified by another instruction.

Error code list[Error code 6763]

Applicable Machine LX series CPU

Error code(D8067) 6763

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Input(X) specified by DSZR, DVIT or ZRN instruction is already used in another instruction.

Managing method

Check whether an input(X) specified by the DSZR, DVIT or ZRN instruction is not used for the following purposes:

Input interrupt (including the delay function)

High speed counter C235 to C255

Pulse catch M8050 to M8057

SPD instruction

Error code list[Error code 6764]

Applicable Machine LX series CPU

Error code(D8067) 6764

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Pulse output number is already used in a positioning instruction or pulse output instruction (PLSY, PWM, etc).

Managing method

Check whether the output specified as the pulse output destination is not driven by another positioning instruction.

Error code list[Error code 6765]

Applicable Machine LX series CPU

Error code(D8067) 6765

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Used number of applied instruction exceeds limit.

Managing method

Used number of applied instruction in the program exceeds the specified limit.

Error code list[Error code 6770]

Applicable Machine LX series CPU

Error code(D8067) 6770

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Flash memory cassette write error.

Error code list[Error code 6771]

Applicable Machine LX series CPU

Error code(D8067) 6771

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Flash memory cassette is not mounted.

Managing method

Check whether the memory cassette is correctly mounted.

Error code list[Error code 6772]

Applicable Machine LX series CPU

Error code(D8067) 6772

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Flash memory cassette is protected against writing.

Managing method

When the write-protect switch of the flash memory cassette was ON, data was transferred to the flash memory.

Error code list[Error code 6773]

Applicable Machine LX series CPU

Error code(D8067) 6773

Error messages OPERATION ERROR

Step Number of error D8069

LED status(RUN) ON

LED status(PROG.E) OFF

PLC ACT STATUS RUN

Diagnosis timing While in the RUN state.

Error contents and causes

Access error to flash memory during online program change.

Managing method

Data was transferred (read from or written to) to the flash memory during online program change.

Error code 6780チ

Overview of error code[error code 6780]

┬Model　　LX series CPU

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┬Error code(D8067)6780

┬Error information,operational error

┬Generate the step storge location D8069

┬LED state (RUN) ,light on

┬LED state(PROG-E),light off

┬CPU operating state,keep on operating

┬Diagnose time,in the running(RUN)

┬Abnormal content and reason

PTO instruction profile table parameter was setted wrong:the difference of pulse frequency interval(include inside segment and intersegment) cannot more than 20000Hz

┬Processing way

Reset the starting frequency of profile table

MODBUS protocol instruction

Basal layer of MODBUS communication is RS485 signal. It link up with twisted-pair, transmit distance so far that can reach 1000 meters, anti-jamming capability is good and low cost .In communication of industry control equipment,it is use abroad,so many manufacturers's transducers and controllers are use this protocol.

communication of data format have two type :HEX code data and ASCII code, respectively named MODBUS-RTU and MODBUS-ASC protocol,the former data communicate directly,but the latter communicate after switch data to ASCII code, so MODBUS-RTU protocol's communication utility, manage simply,used popularity.

MODBUS is single master mult-slave communication system,adopt master slave interrogator-responder system.Every time communication is initiated from master station, slave station passive responded.So controled equipment such as transducer,commonly inner install slave station protocol,and control equipment such as PLC,need provided with host station protocol?〈slave station protocol.

Now MODBUS-RTU protocol set an example,explain typical format of communication frame:

Respond frame format: slave computer address+0x03+origin address of register +number of register+CRC parity

No.	data(byte)meaning	byte number	instruciton
0	head of frame	3.5 bytes leisure time	
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x03(operation code)	1 byte	read register
3	origin address of register	2 bytes	highbit ahead,lowbit after ,refer to register address
4	register number	2 bytes	highbit ahead,lowbit after(N)
5	CRC parity	2 bytes	highbit ahead,lowbit after
6	END	above 3.5 bytes leisure time	

Normal respond frame format:slave computer address+0x03+number of byte+value of register+CRC parity

No.	data(byte)meaning	number of byte	instruction
0	head of frame	3.5 bytes leisure time	
1	address of slave computer	1 byte	value range 1~247,set by D8121
2	0x03(function code)	1 byte	read register
3	byte number	1 byte	value: N*2
4	register value	N*2 bytes	every 2 bytes express one register value,highbit ahead,lowbit

			after .low.register address at the fore
5	CRC parity	2 bytes	highbit ahead,lowbit after
6	END	3.5 bytes leisure time	

If it is master station send communication frame error,or operate fault,send error respond frame,feedback to master station:

Error respond frame:slave computer address+(function code +0x80)+error code+CRC checkout.

No.	data(byte)meaning	number of byte	instruction
0	head of frame	3.5 bytes leisure time	
1	address of slave computer	1 byte	value range 1~247,set by D8121
2	function code+0x80	1 byte	error function code
3	error code	1 byte	1~4
4	CRC parity	2 bytes	highbit ahead,lowbit after
5	END	3.5 bytes leisure time	

When PLC programing,only need attention to information as follows:

Slave computer address:In master station send frame,the address shows target receive address of slave computer.In slave computer responsion frame, stand for master computer address;slave address's setting range is1~247, 0 is broadcast communication address.

Operation type: stand for W/R operation; 0x1=read loops operation; 0x03=read register operation; 0x05=write loops operation; 0x06=write register operation. For transducer,it only supports operation that read 0x03? ﹤ write 0x06.

Register origin address:Meaning register address that Slave computer called. For call on series of MD280,MD320 transducer,correspond to "function code number","command address","running parameter address"; Data number: Data number that call on "register origin address" in sequence, about register variable,unit is word.Register parameter(data): write data(host computer write),or read data(slave computer respond);

Check sum: CRC parity sum of current frame data, auto account in LX'plc, user needn't pay attention.

In communication process, hard to avoid communication error or fault , system software supplied special variable M8063,D8063 to report information of malfunction. If M8063 setting, means of appeared communication malfunction, user read content of D8063, acquired cause of malfunction.

In series of H2U and H1U PLC's system software,encapsulated MODBUS protocol, include MODBUS-RTU master station and slave station,MODBUS-ASC master station and slave station,used in COM1of communication port , use it only need setting corresponding data of system register D8126.

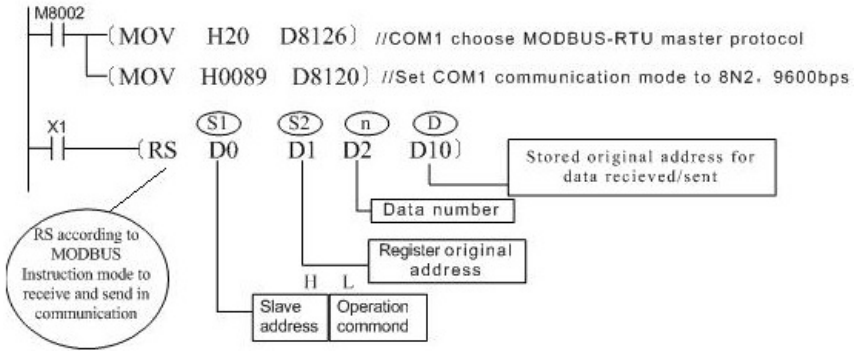
The communicational application of MODBUS master station

Communicational port COM 1 in series of LX PLC can used MODBUS-RTU and MODBUS-ASCII instruction ,you only need set corresponding data of system register D8126.

Communication of MODBUS instruction (master station) have two type: RS expand instruction and MODBUS instruction,separately explained as following:

Used RS expand instruction achieved MODBUS communication program

Setting D8126 to H20, configured communicational protocol of com1 to MODBUS-RTU master station protocol. RS instruction communicated by MODBUS communicational protocol. In process of communication, engrossed register definition different from standard RS instruction, please pay attention to it:


M8002
(MOV H20 D8126) //COM1 choose MODBUS-RTU master protocol
(MOV H0089 D8120) //Set COM1 communication mode to 8N2, 9600bps
X1
(RS S1 S2 n D
D0 D1 D2 D10)
Stored original address for data recieved/sent
Data number
Register original address
H L
Slave address
Operation commond
RS according to MODBUS Instruction mode to receive and send in communication

In RS(MODBUS mode)expend instruction, each of operand definition different with standard RS instruction definition,separately:

(S1) is slave station address (high byte),communicational command(low byte,define by MODBUS protocol);

(S2) is register original address of call on slave station;

(n) data length will be read or write,units is word;

(D) is memory units original address for read or write data, engross continuous address units,length decided by (n) .

In RS(MODBUS mode)instruction, variable type that each of operand support are as following table:

operand	word component										
	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)									✔		
(S2)	✔	✔							✔		
(n)									✔		
(D)									✔		

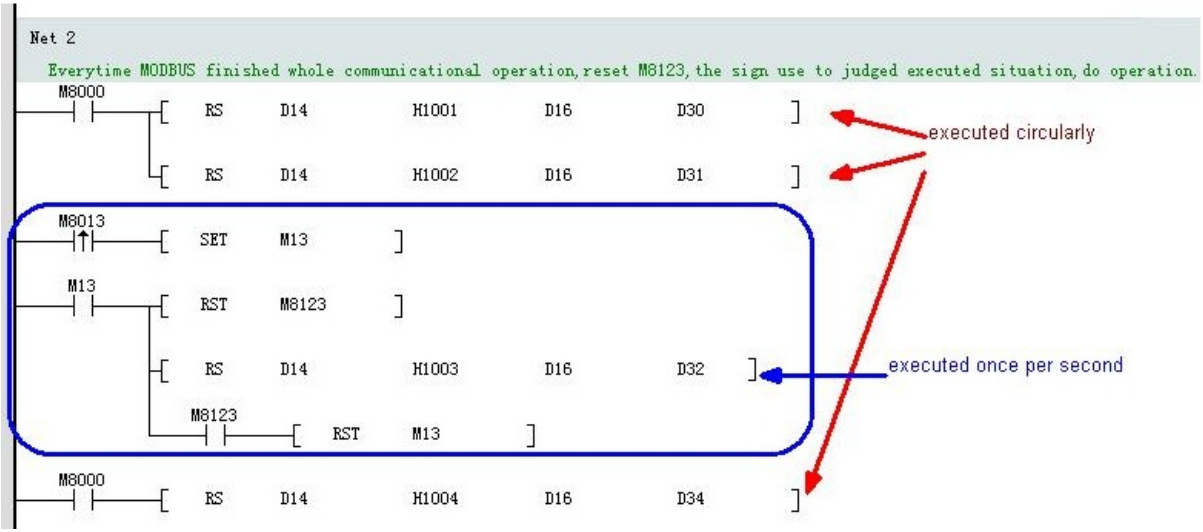
During coding,in front of every RS (MODBUS mode)instruction, evaluated finish every operand units according to communicational operation object address,operational type, operational register address,number of data,units of sent and received and so on. Once start executed,system program auto calculated CRC parity,organized communicational frame,accomplish operation of sent data,received responsion .

If communicated with MODBUS-ASCII protocol(setting D8126 to H30),thereinto receive and send data's HEX-ASCII format changing auto finish by PLC system program, the method user used RS(MODBUS mode) instruction and MODBUS-RTU protocol are all the same.

In the LX PLC program,If there were multi-RS (MODBUS mode) instructiond be drived,when system programs executed,yet after one RS instruction finished

tache of "sent,waited answer,received,checkout parse stored",dealt with next RS instruction the same as,until all of RS instruction done with executed. When restart, user needn't cared about executive order and process,predigested PLC programme design,It wasMODBUS instruction's excellency of LX PLC .

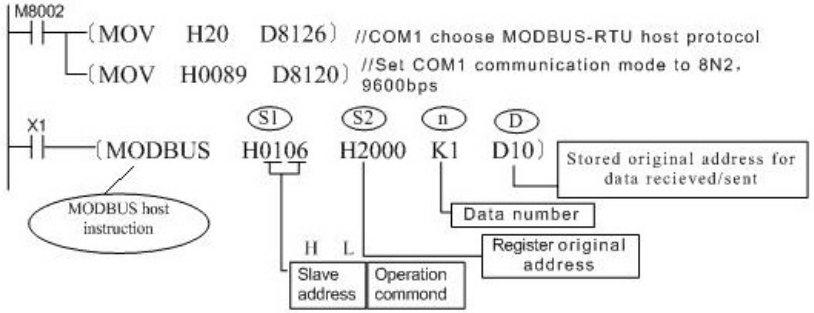
When RS (MODBUS mode) instruction finished one data sent,recieved answer operation, will auto reset M8123,used the sign,can judged whether RS instruction executed accomplish.programed reference as following:



Accomplished communicational programme by use MODBUS instruction

Setting D8126 to H20, configured communication protocol of COM1 to MODBUS-RTU master station protocol,upwards version V24120 in series of LX of PLC,can communicated with "MODBUS" instruction directly.The data type of "MODBUS" instruction's 4 operands be supported were agilely,coding more convenience.

Same qualification as using RS expand instruction,you must set D8126 to H20(RTU) or H30(ASCII)firstly,chose MODBUS master station protocol,then carried through MODBUS communication.



Thereinto operand:

(S1) is slave station address (high byte),communicational command (low byte,define by MODBUS protocol);

(S2) is register original address of call on slave station;

(n) data length will be read or write,units is word;

(D) is memory units original address for read or write data, engross continuous address units,length decided by (n).

In MODBUS instruction,variable type each operand supported as following table:

operand	word component										
	K	H	KnX	KnY	KnM	KnS	T	C	D	V	Z
(S1)	✔	✔							✔		
(S2)	✔	✔							✔		
(n)	✔	✔							✔		
(D)									✔		

Compare RS (MODBUS mode) instruction with MODBUS instruction,latte (S1) (S2) (n) roperand variables all supported constant and D variable type,convenient for user coding.

Because one integrated RS (MODBUS) communication, finished with slave station's end of responsion, system program will reset M8123,after the instruction received tache finished .So user judge the instruction's end according as M8123.

In user's program,the RS (MODBUS) instruction circulational executed more less,and refresh of communicational data more frequentness,refresh speed of read data more quickly,advanced quality of real-time ,arrange read frequency of some unimportance parameter in reason, can improve effect of communication.

Using special variable M8129,can judged malfunction of communicational time-out, dealt with protect or give an alarm correspondingly.

The communicational application of MODBUS slave station

In some industry application, PLC controller be a part of industrial automatization system. To accept monitor of automatization control network ,typical Upper computer such as DCS,industrial PC of running group 2-state software etc., be monitor master computer, communicated with PLC equipment etc. by MODBUS master station protocol ,now communicational port of PLC need communicated with Upper computer by MODBUS slave protocol. Series of LX PLC installed MODBUS-RTU slave protocol and MODBUS-ASCII slave station protocol, besides On COM2 port can run the protocol.

The correlative register of MODBUS slave protocol

COM2 port settings:

M8120	Reserved	D8120	Communication format,interface configuration setting,default 0
M8121	Sending awaiting(RS command)	D8121	Station setting,interface configuration setting,default 0
M8122	Sending mark(RS command) Instruction Execution State(MODBUS)	D8122	Number of Remaining data to be transferred(Only for RS command) Modbus protocol:The interval for comand sending,0=50ms
M8123	Fetching complete mark(RS) Communication error mark(MODBUS)	D8123	Number of Received data(Only for RS command)
M8124	Receiving(Only for RS command)	D8124	Beginning character STX(Only for RS command)
M8125	Reserved	D8125	Termination Character ETX(Only for RS command)
M8126	Reserved	D8126	Communication protocol setting, interface configuration,default 0
M8127	Reserved	D8127	Hyperlink agreement required start address when switch on
M8128	Reserved	D8128	Hyperlink agreement required number of sent data when switch on
M8129	Timeout	D8129	Communication timeout time,interface configuration setting, default 10 seconds(100ms)

COM2 port protocol:

Protocol	Set by D8126	Mode	COM2 communication format
RS command	00H	Half Duplex	Set by D8120
HMI control protocol	01H	Half Duplex	Set by D8120
MODBUS-RTU slave	02H	Half Duplex	Set by D8120
MODBUS-ASCI1 slave	03H	Half Duplex	Set by D8120
RS command	10H	Half Duplex	Set by D8120
MODBUS-RTU primary station	20H	Half Duplex	Set by D8120
MODBUS-ASCI1 primary station	30H	Half Duplex	Set by D8120

The Communication format and bit rate is set by D8120, the definition is as follows:

Tag Number	Name	Contents	
		0(OFF)	1(ON)
b0	Data length	7 bit	8 bit
b2b1	Numeric parity	00: None 01: ODD parity(ODD) 02: EVEN verified(EVEN) MODBUS-RTU slave protocol and commands only support 8 bit data, or it will cause communication error	
b3	Stop bit	1 bit	2 bit
b7b6b5b4	Bits Per second(bps)	0111: 4800 1000: 9600 1001:19200 1010: 38400 1011: 579600 1100: 115200	

In PLC program, after finished config of some registers above,When the communicational port in correspondence with had communicational frame that MODBUS master station sent to master computer address,PLC system program will auto organized MODBUS communicational frame responsion according to communicational request, needn't user program participated in.

Operation MODBUS slave station supported

When LX PLC be MODBUS slave station,communicational operational command supported MODBUS's 0x01,0x03,0x05,0x06,0x 0f ,0x10 etc. ,through this command,the variable that PLC's winding can be read-write were M,S,T,C,X(read-only),Y and so on ;register variable were D,T,C.

When master computer of MODBUS communication visited(read or write)interior variable of PLC slave computer,must followed definition of communicational command frame as follows ,as well as index method of variable address,then carried through normal communicational operation.

1.1 command code 0x01(01): read winding

Request frame format: slave computer address + 0x01+ winding original address + winding number + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
	slave computer	1 byte	value range 1~247 set by D8121

1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x01(command code)	1 byte	read winding
3	winding original address	2 bytes	highbit ahead,lowbit after,refer to register address
4	winding number	2 bytes	highbit ahead,lowbit after(N)
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Response frame format :slave computer address + 0x01+ byte number + winding state + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x01(command code)	1 byte	read winding
3	byte number	1 byte	value: [(N+7)/8]
4	winding state	[(N+7)/8]bytes	Every 8 windings add up to a byte,if finally one less to 8 bits,un-definition part fill in 0.The 8 windings forwardly at first byte,the winding have littlest address at lowest bit.analogically in turn.
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Error response :refer to error response frame

1.2 Command code0x03(03):read register

Request frame format: slave computer address + 0x03 + register original address + register number + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247, set by D8121
2	0x03(commond code)	1 byte	read register
3	register original address	2 bytes	highbit ahead,lowbit after,refer to register address

4	register number	2 bytes	highbit ahead,lowbit after(N)
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Response frame format: slave computer address + 0x03 + byte number + register value + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x03(command code)	1 byte	read register
3	byte number	1 byte	value: N*2
4	register value	N*2 bytes	Eevery 2 bits indicated one register value,highbit ahead,lowbit after.which have less register address was at ahead
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Error response : refer to error response frame

1.3 Command code 0x05(05): write single winding

Request frame format: slave computer address + 0x05 + winding address + winding state + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x05(command code)	1 byte	write single winding
3	winding address	2 bytes	highbit ahead,lowbit after, refer to winding address
4	winding state	2 bytes	highbit ahead,lowbit after.availability except 0
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Response frame format:slave computer address + 0x05 + winding address + winding state + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x05(command code)	1 byte	write single winding
3	winding address	2 bytes	highbit ahead,lowbit after,refer to winding

			address
4	winding state	2 bytes	highbit ahead,lowbit after.availability except 0
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Error response: refer to error response frame

1.4 Command code 0x06(06): write single register

Request frame format: slave computer address + 0x06 + register address + register value + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x06(command code)	1 byte	write single register
3	register address	2 bytes	highbit ahead,lowbit after,refer to register address
4	register value	2 bytes	highbit ahead,lowbit after.availability except 0
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Response frame format: slave computer address+0x06+register address + register address + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x06(command code)	1 byte	read single register
3	register address	2 bytes	highbit ahead,lowbit after,refer to register address
4	register value	2 bytes	highbit ahead,lowbit after, availability except 0
5	CRC parity	2 bytes	highbit ahead,lowbit after

Error response: refer to error response frame.

1.5 Command code 0x 0f (15): write multi-winding

Request frame format: slave computer address+0x 0f +winding original address + winding number + byte number + winding state + CRC parity

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x 0f (command code)	1 byte	write multi-single winding

3	winding original address	2 bytes	highbit ahead,lowbit after ,refer to winding address
4	winding number	2 bytes	highbit ahead,lowbit after.N,Max. is 1968
5	byte number	1 byte	value:[(N+7)/8]
6	winding state	[(N+7)/8] bytes	Every 8 windings add up to a byte,if finally one less to 8 bits,un-definition part fill in 0.The 8 windings forwardly at first byte,the winding have littlest address at lowest bit.analogically in turn.
7	CRC partiy	2 bytes	highbit ahead,lowbit after

Response frame format: slave computer address+0x 0f +winding original address + winding numbe r+ CRC partiy

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x 0f (command code)	1 byte	write multi-single winding
3	winding original address	2 bytes	highbit ahead,lowbit after,refer to winding address
4	winding number	2 bytes	highbit ahead,lowbit after
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Error response: refer to error response frame.

1.6 Command code 0x10(16): write multi-registers

Request frame format: slave computer address + 0x10 + register original address + register number + byte number + register value + CRC partiy

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x10(command code)	1 byte	write multi-register
3	register original address	2 bytes	highbit ahead,lowbit after,refer to register address
4	register number	2 bytes	highbit ahead,lowbit after. N Max. is 120
5	byte number	1 byte	value:N*2
6	register value	N*2(N*4)	
7	CRC partiy	2 bytes	highbit ahead,lowbit after

Response frame format: slave computer address+0x10+register original address + number of register r+ CRC partiy

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	0x10(command code)	1 byte	write multi-register
3	register original address	2 bytes	highbit ahead,lowbit after,refer to register address
4	register number	2 bytes	highbit ahead,lowbit after.N,Max. is 120
5	CRC partiy	2 bytes	highbit ahead,lowbit after

Error response: refer to error response frame.

1.7 Error response frame

Elrror response: slave computer address + (command code + 0x80) + error code + CRC partiy

No.	Data(byte)meaning	Number of byte	Instruction
1	slave computer address	1 byte	value range 1~247,set by D8121
2	command code+0x80	1 byte	error command code
3	error code	1 byte	1~4
4	CRC partiy	2 bytes	highbit ahead,lowbit after

2.1 Winding address

Winding: is bit variable,only have two states 0 and 1.The PLC includeM, S, T, C, X, Y variable etc. .

Variable name	Original address	Winding number	Instruction
M0~3071	0(0)	3072	
M8000~M8255	0x 1F 40(8000)	256	
S0~S999	0xE000(57344)	1000	
T0~T255	0xF000(61440)	256	
C0~C255	0xF400(62464)	256	
X0~X255	0xF800(63488)	256	
Y0~Y255	0xFC00(64512)	256	

2.2 Register address

Register: is 16 bits(word) or 32 bits (double word) variable,In the PLC,16 bits variable include D, T, C0~199;32 bits variable are C200~255.

Variable name	Original address	Winding number	Instruction
D0~D8255	0(0)	8256	

T0~T255	0xF000(61440)	256	
C0~C199	0xF400(62464)	200	
C200~C255	0xF700(63232)	56	32-bit register

Instruction: Through MODBUS visited 32 bits register that segment of C200~C255, one register as 2 register, one 32-bit register engross 2 16-bit register space.For example,user read or write 4 registers of C205~C208,MODBUS address is 0xF 70A (0xF700+10),register number is 8(4*2).

32 bits register un-support write single register(0x06) command code.